# THE LAWS OF HEALTH

AND

# HOW TO TEACH THEM

WINSLOW

AND

WILLIAMSON



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r 13, 1926

Fear impedes progress,

Pediculosis - Head lice.
Treatment - Kerosene + sweet oil,
applied at night tied up
... ledin
... t
... ntly,
... towel
... disease
... ee-
... y



First aid Kit.

Glass Fruit Jars.

Bandages. 1 Finger 2-1½" + 2-2".

Adhesive Tape.

Murcurocrone (Furnished by board of health.)

Applicators. a few made up.

Cotton.

Ammoniated murcury.

Zinc oxide ointment

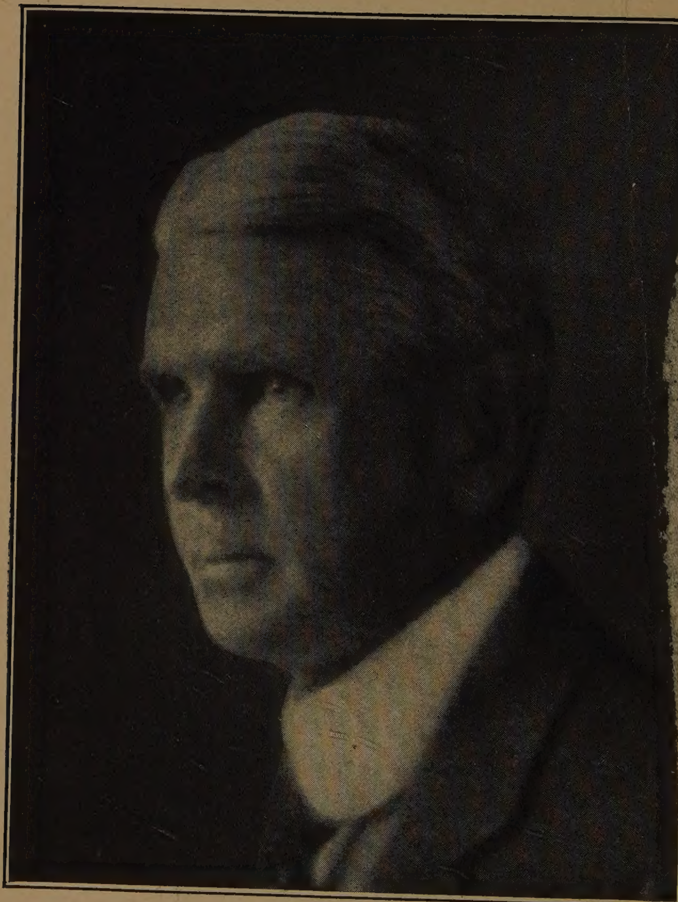
Scissors

Tongue blades

Alcohol-(rubbing)

Boric Acid.

Nov. 11



Dr. L. Emmett Holt, 1855–1924
Pioneer in American Child Hygiene

# THE LAWS OF HEALTH

AND

# HOW TO TEACH THEM

BY

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TO
THE FRIENDS WHO MADE
THIS BOOK POSSIBLE

Objectives of Education

1. health.
2. command of fundamental [processes
3. worthy home membership.
4. vocation
5. citizenship
6. worthy use of leisure
7. ethical character.

# INTRODUCTION

The modern program of health education represents the fusion of three different movements, originally almost wholly independent in their inception and development. Physical education was introduced into the United States nearly fifty years ago. At about the same time the teaching of hygiene with required emphasis on "temperance physiology" became part of the school curriculum. Only in the last decade of the nineteenth century was medical inspection of school children introduced. Much was accomplished in the upbuilding of sound bodies through regulated exercise and in the detection and correction of physical defects; but both these predominantly practical efforts to raise the general level of healthy living suffered for lack of an adequate development of fundamental principles in the mind of the child, while health instruction remained formal and detached and to a large extent uninspired and unrewarding.

During the past fifteen years there has been born in the field of health education "a new world through which blow the winds of a different heaven." Largely through the stimulus of the Child Health Organization of America, there has come a general recognition in this country and gradually throughout the world that Health Education should be conceived as an organized program. This program includes classroom instruction, physical education, and medical supervision correlated to promote the maximum of health and vigor for the child at the moment and to cultivate an efficient health consciousness that will keep him in the future a healthy citizen of a healthy state. The whole subject has

become concrete and vital; and it has been so enriched by modern methods of teaching as to become one of the most important subjects—some of us would be tempted to say, the most important subject—in the whole curriculum.

Such new developments have brought with them a new and compelling challenge to the teaching profession. The development of the newer type of health teaching has inevitably led in many cases to undue emphasis and to the substitution of propaganda for education. It is most essential that health teaching should be directly and insistently interwoven with the formation of health habits. However, the learning of health habits which a child can practice at the moment is of relatively little value, unless these habits are based on a real comprehension of the workings of the human body and of the factors which make for health and disease, a comprehension which is expressed in the intelligent adjustments of the life which is to follow.

A real need of the moment, then, is for teachers who shall translate the ideals of health education into concrete achievement. They must understand physiology and hygiene and sanitation on the one hand; they must be familiar with the technique of modern health education on the other. They must see the problem as a whole and they must know how the answer can be found in an intelligent and productive health consciousness on the part of the child, the school, and the community.

This book on "The Laws of Health" has been prepared in the hope that it may aid present and prospective teachers in meeting this new demand upon their vision and their power. It represents the combined viewpoints of a teacher in a medical school, whose business lies in the furtherance of research and advanced teaching in the field of health, and of a practical school administrator responsible for the guidance and direction of health education on a state-wide basis. The authors have attempted to set forth the important principles

of physiology and hygiene and sanitation established by the most recent research and the methods of teaching these principles which have been approved by modern pedagogy and tested out with success in actual practice. There can be no more inspiring task than to write of such matters to the teachers of the country. In their hands today rest not only the intellectual, but in considerable measure the physical, potentiality of future generations. It is through them that we may hope to bring about that day when the ideals of health and power shall so prevail that, in the words of William James, "simply to live, move, and breathe shall be a delight."

Thanks are due to the American Child Health Association and to Mrs. L. Emmet Holt for the use of the photograph of Dr. Holt; to the National Education Association for the use of graphs; to the Richmond Tuberculosis Association for permission to reprint "Health Fairies"; to The Macmillan Company for permission to quote stanzas from "The Child Health Alphabet"; to John Wiley and Sons for the use of copyrighted material from "Sources and Modes of Infection," by C. V. Chapin; and to the following publishers for permission to reprint the singing games in Part Three: A. S. Barnes and Company for the "Danish Dance of Greeting"; A. Flanagan Company for "How-dye-do, My Partner" and "I See You"; and G. Schirmer, Inc., for the "May Dance."

Pauline Brooks Williamson

Charles-Edward Amory Winslow

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## *PART TWO—CONTENT*

# PART ONE

## *OBJECTIVES*

"Men at some time are masters of their fates."

—SHAKESPEARE, *Julius Cæsar.*

# THE LAWS OF HEALTH AND HOW TO TEACH THEM

## CHAPTER I

### THE GROWTH OF THE HEALTH IDEAL

**Ideals of Living.**—The story of our lives, as it is being written in the history of the world today, shows that the promotion of health, or physical well-being, is becoming more and more a dynamic force in personal and social development. We are not interested in health merely for health's sake, but are gaining a fuller appreciation of its significance in the accomplishment of our hopes, desires, and ambitions.

With awakening consciousness of our own powers as individuals and of our dependence upon one another, we increase our efforts to live richer and fuller lives. A broader conception of the meaning of health is borne in upon us as we learn more about ourselves and the forces at work in our lives. Just as a modern office building is concrete evidence of the work of many invisible forces and the result of a definite purpose and plan, so are our lives the expression of a purpose and plan that has run through the ages. Through the cloud of mystery that has surrounded life since the dawn of creation, there shines the accumulating knowledge of

guiding principles that are powerful, used in our daily lives, to lift us higher and higher as mankind travels onward from generation to generation.

One of the individual forces that has produced very definite results in our lives, and is destined to play a still more important part in the future, is the desire for personal freedom and self-development. The struggle for life, liberty, and the pursuit of happiness, waged on a high or low plane, according to the character of the individuals taking part, has made marked progress in securing political, religious, and economic freedom. We can more fully appreciate these advances when we consider the forces that have been overcome, and realize that we have met with some degree of success in freeing ourselves from the tyranny of fear and ignorance, ill-health, and disease. Today, as never before in the history of the world, we are realizing the inalienable right of the individual to self-development, to the enriching of his personality by all the means at his disposal, and to the sharing of that personality with his fellow-citizens.

On every hand are the evidences of our desire to know more about ourselves, to understand others, and, in turn, to be understood by them, that we may all share in the fruits that come from coöperative social activities. In our effort to find ourselves, we apply elaborate medical examinations and invent mental tests and achievement tests. Psychology and psycho-analysis are appealed to but, unsatisfied by their revelations, we make insistent demands to know more. We are discovering that personality with its different phases—physical, mental, moral, social, and spiritual—

has limitless forms of expression and a boundless capacity for development. We are learning that, if any one phase is developed at the expense of another, the whole individual suffers.

In our attempt to make the most of our lives and to live the successful social existence, we appeal to art, music, literature, science, philosophy, and religion —to all those intangible factors that enrich the spirit. But for these to have their full effect, that spirit must be served by a healthy, efficient body. The aim of modern civilization, in school, state, and church, is to develop personalities able and willing to respond to the demands of a rapidly developing and maturing society.

**Worth of the Individual.**—Side by side with this development of personality has gone an increasing realization of the value of the individual. In earlier ages, human life was cheap. The tyrant slew his thousands to appease his vanity or to further the fortunes of his dynasty. Class robbed class without understanding that the impoverishment of one section of a country's population involved the impoverishment of all. The human being today has a value—an enormous actual and potential value. We have had various estimates of the worth of an individual, measured by a scale that varies from that of the slave owner who sells a human soul for a price to that of the parent who will not part with his child for the wealth of the world. Economists are offering figures to indicate the value to society of individuals of different ages. Their tables show to some extent what a human life means to the state and the loss that society suffers

when one of its members has his life crippled or shortened.

Among controllable factors that diminish the value of a human being to his fellows, preventable disease stands first. One economist estimates that the United States loses every year over three billion dollars through preventable disease and death. During the World War—a period of less than five years—over seven million persons were killed; but it is estimated that not less than seventeen million lives are lost each year as a result of preventable disease.

Appalled by such reckless wastage of life, modern civilization is making strenuous efforts to stop these human and financial losses. One result of this effort is seen in the increased value placed upon the life of the individual and in the greater concern for the welfare of women and children. Educators, sociologists, and economists are endeavoring to prolong life and safeguard health, and thus preserve this tremendous asset of our society.

Childhood has been called the greatest discovery of the twentieth century and much is being done to conserve child life, but today we also realize more fully than ever before the importance of the adult. The man who reaches maturity represents one of the nation's investments, for age and experience bring an increased ability to cope with and solve the manifold problems of our modern civilization. If society is to reap the fullest benefit from its investment in the individual, it must preserve that life in fruitfulness as long as possible by prolonging life and stamping out all forces that may threaten its usefulness. Premature

old age, with its physical disability and intellectual deterioration, cuts short the adult's period of social usefulness, and constitutes a heavy burden upon society. If the life span can be prolonged the state may save the individual, retain for itself the invaluable stores of experience gathered by him, and apply them to the solution of the complicated problems of social life. Modern thought has, therefore, applied itself to finding new methods for the prolongation of life. Much is being accomplished in advanced countries through the development of modern science and through public health organizations.

**Objectives of Public Health.**—During their short histories, public health organizations have achieved wonders in prolonging human life and in bringing under control the scourges that have so long afflicted humanity. The *Report of the Surgeon-General of the United States Public Health Service* for 1924 gives a stimulating summary of what has been done in this direction:

> It may be recalled that the average length of human life in the sixteenth century was estimated to be between 18 and 20 years; that at the close of the eighteenth century it was still less than 25 years; and as late as 1900 it was between 45 and 48 years. Comparing with these figures the present average length of life of 56 years in the United States, and remembering that approximately 15 years have been added to the span of human life in the United States since 1870, and considering that in India at the present time the average length of life still remains about 25 years, we can in some measure appreciate the importance of modern methods of preventing disease and of conserving health and life. It should be stated, however, that this marked improvement in conditions in the United States is by no means solely due to preventive measures directed against disease itself, but also to better eco-

nomic and industrial conditions, matters which are today very properly occupying the attention of health departments of all civilized countries.[1]

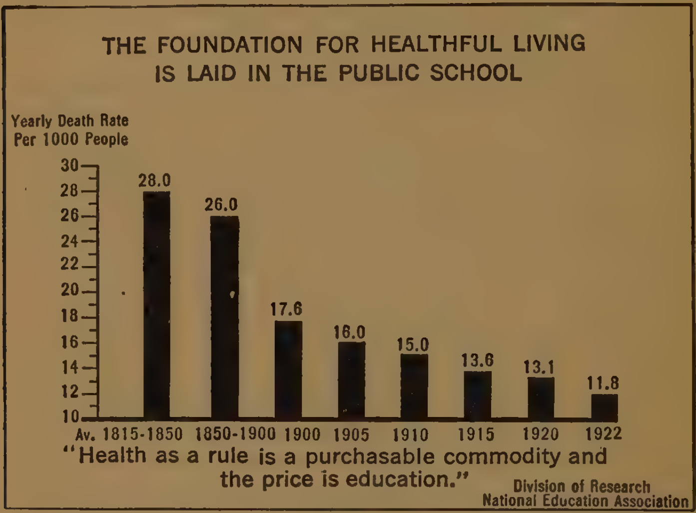


FIG. 1.—Graph Showing the Reduction in the Death Rate Brought About in a Hundred Years by Improvement in Living Conditions.

These marvelous results can be understood when we realize that in one town, Lawrence, Massachusetts, the provision of a pure water supply reduced the deaths from typhoid fever by 80 per cent, and that in New York City the death rate was reduced by 50 per cent in fifty years as a result of sanitary measures.

**Public Health in Ancient Times.**—The most ancient and primitive peoples known to man have had some

[1] *Annual Report of the Surgeon-General of the Public Health Service*, Treasury Department, Bureau of the Public Health Service, Washington, December 1, 1924.

system of curative or preventive medicine. Savage and barbarous races used magical charms and incantations to cure disease, supplemented by the medicine man's meager knowledge of therapeutics or primitive sanitary measures. When history reveals the earliest civilizations, we find clear evidences of public health work among them. Assyria, Babylonia, Egypt, Crete, Greece, and Rome made use of sanitary science in ancient times. Cyrus the Great who showed much concern for the soldiers in the Persian army was advised by his father: "Thy chief anxiety should be to provide for health, for thou oughtest to take care to prevent the army from falling into sickness at all." Hippocrates, the father of medicine, advocated boiling, or filtering, all drinking water. The inhabitants of the Tigris and Euphrates valleys had drains and sanitary conveniences. Jerusalem was well sewered, and had a good water supply; Carthage had the oldest known cisterns; and Rome had sewers as early as 800 B.C. Egypt had some of the oldest wells, and China had the deepest. Moses, about 1600 B.C., advocated and enforced many hygienic laws of preventive rather than curative nature, as recorded in Deuteronomy and Leviticus.

These early advances in hygiene and sanitation were lost after the fall of Rome. During the Dark Ages that followed, plagues resulting from the abandonment of sanitary science swept Europe again and again, at times wiping out as much as a quarter of the population of whole countries.

**Public Health in Modern Times.**—So complete was the forgetfulness of sanitation and the principles of

public health during the Dark Ages that these sciences had to be discovered anew in modern times. In the sixth century the spread of leprosy led to the initiation of primitive methods of isolation as a safeguard against contagion, but effective quarantine was not introduced until 1374, when Venice adopted it in its fight against an epidemic of plague.

The beginning of the modern public health movement, as a definite and conscious effort to prevent disease in the future rather than merely to cope with existing pestilence, dates only from the sanitary awakening which took place in England less than a century ago. The development of scientific knowledge and of the humanitarian spirit (the latter exemplified by the Wesleys, John Howard, and the Earl of Shaftesbury) in the late eighteenth and early nineteenth centuries culminated in the famous report by Chadwick in 1842 on the "Sanitary Condition of the Labouring Population of Great Britain." As a result of this report a general campaign for environmental sanitation spread rapidly from England to America and to the other countries of the civilized world.

Shortly afterward in the laboratories of the École Normale at Paris, the great Frenchman, Louis Pasteur, by his epoch-making demonstration of the germ theory of disease (1865–1877), began to lay the foundations of sound knowledge which have made the public health movement so effective. Upon this scientific basis bacteriology made rapid strides in the eighties and the nineties of the last century. Boards of health, in city and town, became every year more efficient and more important factors in their communities. State boards

of health were organized, and the United States Public Health Service, once merely an agency for the hospital care of seamen, developed into a beneficent national force. The Office International d'Hygiène Publique was organized at Paris under the Convention of Rome in 1907 to consider problems of health which in importance transcended questions of national boundaries.

The changed conditions resulting from the World War, with the breakdown of ancient civilizations in eastern Europe, made urgently important the provision of new and more effective means for dealing with international health problems. Under the covenant of the League of Nations there was therefore created a Health Section of the League which has rendered signal service in fighting epidemics in Poland and Russia and the Near East, in standardizing health statistics throughout the world, and in simplifying the tasks of maritime quarantine.[1]

**The Challenge of the Future.**—The stupendous work that is being done not only awes us but it moves us to meet the challenge of a civilization threatened by the wastes of the recent war. To the preservation of a culture which it has taken centuries to produce, as well as to the immediate mitigation of human suffering, the best sanitary knowledge and the clearest economic foresight, and the fullest generosity of the world must be applied. The challenge is to us as individuals and as nations. We are climbing with a scheme of moving values in an age of enlightenment, service, and

[1] For additional information refer to "The War against Germs," by C. A. L. Reed, *The Review of Reviews*, July, 1924.

progress, with a zealous and righteous purpose to lift our race a little higher and to make it a little better, from generation to generation. There is something ahead of us to do, to reach, to attain—our desires, our ambitions, and our ideals. Bound up with the accomplishments which we inherit from the past, are impelling obligations to the future. In great countries where democracy is the watchword, the supreme motives back of the desires which prompt our conduct of daily living, are to do the best for ourselves in fitness, to give the best in ourselves as members of the family, and to reach the summit of service to our community, our nation, and our world. As we continue to move forward, we take as our measure of progress the conservation and enrichment of human life, and we gain momentum as we become conscious of our own capacity for growth and our inescapable responsibility to others.

### Topics for Investigation and Discussion

1. The importance of health in modern life.
2. Economic and social justification for developing public health organizations.
3. The growth of the public health movement in modern times.
4. Factors influencing the increased average length of life in the United States.
5. Individual and community responsibility for the health of the citizens of a democracy.

# CHAPTER II

## THE SCOPE OF HEALTH EDUCATION

**The Public School in Modern Life.**—In the United States the public school is the concrete expression of our belief that every child in the country should have the opportunity to develop himself so that he may be of the greatest worth to himself and to society. Upon this principle has been based our national prosperity and happiness. Scarcely had the Puritan Fathers felled the trees for their log cabins before they began to erect schools and colleges. As fast as the country was settled and its material prosperity increased, just so fast did schoolhouses arise, for education spells that equality of opportunity upon which our political system is based. Perhaps no country in the world realizes quite so strongly as the United States its responsibility toward the child. To prepare him for the duties of citizenship and the privileges and responsibilities of a civilized society, we have worked out far-reaching educational programs and expended vast sums in the building and equipping of schools.

Despite our traditional interest in education, we are not always able to define just what we mean by the term. There are almost as many interpretations of education as there are teachers. The qualities of the educated man have been variously described. These

descriptions range from the remark of the little girl who said he is the man "who tinks his own tinks" to the statement of Chambers' Encyclopedia, "In the widest sense of the word, a man is educated either for good or evil by everything he experiences from the cradle to the grave." Though our educational leaders have differed among themselves about definitions of education, there is now little difference concerning its purpose. For many years educators were accustomed to interpret the principle of self-development for the student in purely mental terms. The school was considered to have fulfilled its mission, if the school child were trained to use his mind and to develop it as a useful instrument. Today, however, all are agreed that education should not only deal with the mental development of the individual, but should also prepare him for a life of physical fitness, thereby increasing his usefulness to himself and to society.

**Need of Health Education.**—In this day of keen competition and acute specialization man's greatest service is possible only when a sound mind is served by a sound body. Health must be the foundation of successful effort. The World War made distressingly clear how necessary to a nation is a citizenship of sound physique and trained body. When the United States examined physically the 3,208,446 men it drafted for military service in that struggle, 16 per cent were found unfit for military duty of any kind and 11 per cent were suitable for special or limited service only. For some years before the draft revelations educators had been awaking to the fundamental importance of health and physical instruction in any adequate educational

system. The 1924 *Yearbook of the Department of Superintendence of the National Education Association* gives as the seven main objectives of education: health, command of fundamental processes, worthy home membership, vocation, citizenship, worthy use of leisure, and ethical character.

Notwithstanding the unanimity of educational authorities on the importance of a sound body and the startling revelation of the draft records, the country has been distressingly backward in adopting any comprehensive system of physical education. In 1919–20 there were in the United States 27,728,788 children from five to seventeen years of age inclusive. Of this number 21,578,316 were enrolled in the public schools, and 2,034,642 in private and parochial schools. Over a billion dollars is spent by our nation each year for the education of these pupils, but only twelve to fifteen million dollars is expended for school health work. That is sixty-five cents per child per year. Less than 1.5 per cent of the total school fund.

**Health of the School Child.**—Approximately two hundred thousand children of elementary and high-school age die each year in the United States. Of this total, 130,000 have been enrolled in the public schools during the year. Forty, perhaps fifty, thousand of such deaths are reasonably preventable. Under adequate physical inspection and health instruction thousands of these children could be saved. Researches have recently been made to learn the effect of the child's health upon his class standing. Some remarkable figures have resulted from these investigations, indicating that ill health and remediable defects

alone cause 15 to 20 per cent of non-promotion, retardation in studies, and elimination of children from school. These are huge economic and social wastes that proper physical education and inspection, followed up with curative and remedial measures, can greatly reduce, if not entirely eliminate. In the prevention of school failure, physical education has an opportunity not yet fully grasped.

If we accept the aim of education as the greatest possible development of individuals, we must include in our program recognition of the laws that govern all phases of their lives. Inasmuch as the attainment of full efficiency depends upon the normal functioning of healthy bodies we cannot afford to neglect the physical education of our children. We have learned that we cannot expect a pupil who is hungry, or physically defective, or who has to study in a room poorly lighted, badly heated, and inadequately ventilated, to make a high rating in reading, writing, or arithmetic. Neither can we expect him to feel kindly toward his neighbor, or to enjoy fully the privilege of living.

**History of Health in Education.**—From very early times the importance of physical activities has been recognized in almost every educational system. From ancient China, India, Egypt, Babylonia, and Assyria archaeologists and students have collected indisputable proofs that physical training was a part of schooling for the young. The Persians gave physical training a prominent place in their educational system. Perhaps at no time in the history of the world has physical education received the attention that it did in ancient Greece. With the Athenians, training and developing

the body received the same emphasis as instruction in music, poetry, and public speaking. Sparta, more militaristic, required compulsory physical training for the strengthening of its armies. Ancient Rome, also, attributed tremendous value to physical training, not so much for aesthetic and social reasons as for the production of sturdy warriors. Strength rather than health was their aim.

When the Renaissance rediscovered the culture of Greece and Rome, it rediscovered also the Greek and Roman ideals of physical training. Consequently, from the beginning of the modern era, students and leaders have more and more emphasized the importance of physical training in education. Jean Jacques Rousseau in the middle of the eighteenth century declared emphatically: "In order to think we must exercise our limbs, our senses, and our organs, which are the instruments of our intelligence. And in order to derive all the advantages possible from these instruments it is necessary that the body which furnishes them should be robust and sound."

With the opening of the nineteenth century educational leaders began to realize their responsibility for the physical as well as the mental well-being of the child. During the first quarter of that century arose organized movements for physical training in the protection of health. Denmark was the first European country after the seventeenth century to introduce physical training or to include it as an important part of its educational program. This country also prepared teachers for this work by providing courses in theory and methods of gymnastics. From Europe, physical

education came to America early in the nineteenth century. In 1825–26 Massachusetts established the first school gymnasium, the first college gymnasium, and the first public gymnasium. These were opened at Northampton, Cambridge, and Boston, respectively. Gymnasium work was popular and spread rapidly. During the middle years of the century physical education was greatly strengthened by the arrival in America of many Germans who brought with them the ideals of German physical education and gymnastics.

A second line of development, separate in its inception but now fused into the general scheme of the school health program, was the gradual growth of machinery for the medical supervision of the health of the individual school child. The perfecting of this machinery has been described as follows:

> The city of Dresden instituted tests for the vision of school children in 1867. Sweden probably appointed the first true school physicians in 1868. Russia provided for medical inspection in 1871 and Austria in 1873, but the system, in its full modern sense, was really introduced at Brussels in 1874 and at Paris in 1879. The idea spread rapidly, particularly in Germany, and was introduced to the United States in effective form in Boston in 1894. This action was inspired by an epidemic of diphtheria which had occurred in the schools, and the primary duty of the physicians was to detect communicable disease, in other words, to exercise the conventional police power of the health department, to protect one child against another. If the proposal had been made thirty years ago to establish school clinics for the treatment of non-contagious physical defects, it would probably have been hailed as a highly dangerous form of paternalism.
>
> Yet the logic of the situation proved irresistible. When the physicians actually began to examine the children in the schools

they found scores suffering from defective teeth, from defective vision, from defective hearing, from enlarged tonsils, and adenoids, for every one that was the victim of acute communicable disease. They devoted more and more attention to the problem of assisting each individual child to reach his highest possibilities of physical welfare. The school nurse was introduced in 1902, to carry the message of hygiene into the home and to secure the prompt treatment of the physical defects discovered by the school physician. Finally, when it appeared that, for many children ready to avail themselves of treatment, treatment facilities were lacking, the school clinic came into the picture. For the school child, at least, it was recognized as sound public policy to make sure that, so far as possible, remediable defects and diseases shall be found and remedied and to provide at the public expense whatever medical services are needed to facilitate that end.[1]

Finally, as a third element in the health program, now indissolubly united with physical education and medical supervision, we have the direct instruction of the child in those principles of physiology and hygiene which are essential for the maintenance of health. Hygiene as an element in the school curriculum has had a somewhat curious and interesting history. During the period of agitation for the passage of state and federal laws combating the evils of alcohol, state legislation was enacted which required the devotion of certain specified hours to the teaching of hygiene, with particular emphasis on the evil effects of alcohol. The fundamental aim of these laws was an admirable one; but, as is frequently the case when school curricula are directly controlled by legislative action, the results were at first not wholly fortunate from a pedagogic standpoint. The subject matter of hygiene

[1] C.-E. A. Winslow, *Evolution and Significance of the Modern Public Health Campaign.* Yale University Press, New Haven, 1923.

and the preparation of the teachers made impossible anything more than a formal and unrewarding compliance with the letter of the law. During the past ten years, however, the whole situation has been altered. Thanks in large measure to the inspiring influence of the Child Health Organization, founded by the late Dr. L. Emmett Holt and directed by Miss Sally Lucas Jean, a new spirit has transformed the whole field of health education. Formal, didactic instruction in anatomy and pathology has given place to a vital program centered about the formation of health habits. A new technique of teaching, including health songs, health games, health clowns, health fairies, and health dramas, has been provided to aid in this important task. Probably no more significant development has occurred in the last decade in the whole field of education than the expansion of health teaching. The fusion of this type of teaching with the earlier developments of physical education and medical supervision has given us what today we call Health Education. It has brought us to a point where, as someone has said, "It is no longer a question of the place of health education in the curriculum, but of the place of the curriculum in health education."

**The Teacher's Preparation.**—In view of these developments the problem of the preparation of the teacher for the tasks of health education becomes of paramount importance. The first attempt made in America to prepare teachers in physical instruction was made by Dio Lewis, (1861–68) at his Normal Institute for Physical Education in Boston, but it was not until late in the nineteenth century that state normal schools

and universities began to give instruction in physical education. The University of California, in 1898, instituted courses in physical education and gave credit for them. One year later Columbia University gave summer courses in physical education and allowed them to be used in fulfilling degree requirements.

With the beginning of the twentieth century the teaching of health and physical training as part of a required normal course became more and more prevalent, and boards of education began to require evidence of preparation in this work before granting certificates for teaching. For example, the state of Virginia, with the passage of the West Law in 1920, put into operation a very comprehensive program for training its teachers in health and physical education. Under the joint supervision of the State Board of Health and the State Board of Education, health instruction for prospective teachers is provided in all normal schools and teachers' colleges. In 1922 twenty-five out of thirty-seven colleges and normal schools in the state had courses in school hygiene, physical inspection, and physical education. For the convenience of teachers in the field who are unable to attend these teacher-training institutions several Virginia colleges give health courses in their extension divisions and the Board of Health offers a correspondence course as a minimum requirement. The State University, assuming its place in the state-wide program, offers, in addition to the courses for classroom teachers, two courses for training specialists in this field that lead to the B.S. degree in Health Education and the B.S. degree in Physical Education.

The courses in the teacher-training institutions of Virginia are definitely planned to prepare the teacher to work out in the classroom the comprehensive health program outlined by the state and required by law. This program includes an annual physical inspection of all children in the public schools by the teacher assisted by the nurses and physical directors; coöperation by the teacher with the doctor and nurse in securing correctional work through the efforts of the parents and the organization of clinics; positive health instruction; provision for physical activities; and the care of the environment including playgrounds, school buildings, and equipment. Other states are actively engaged in organizing programs for health and physical education along similarly advanced lines.

**The Teacher's Opportunity.**—Upon the teacher rests the responsibility of training her students in habits of right thinking, in habits of right doing, and in habits of right living. As understood today, health education includes all means that make for physical well-being, and the providing of an environment favorable for growth and for productive work.

All phases of this work are important: regular medical examinations, correction of defects, habits of healthy living, remedial and developmental physical activities, and healthful environment. No one element can be neglected without detriment to the child and retardation of his progress. The coöperation of the classroom teacher with physicians, nurses, physical directors, and parents is necessary for the child's normal growth. Just what part each shall take is worked out differently in different communities. In some counties

and cities of advanced thinking the parents are having their children given complete medical examinations before they enter school. A county in one state in which pre-school clinics are being held has as its slogan, "Have every child ready to enter school." In other communities the classroom teacher, unaided by doctors, nurses, or physical directors, makes the physical inspection at the beginning of the school year and recommends to the parents consultations with the family physician.

### Topics for Investigation and Discussion

1. The purpose of education.
2. The fundamental importance of health education in an adequate educational system.
3. Methods of improvement of health instruction in the public schools of the United States.
4. Coördination of physical education, medical examination, and instruction in hygiene.
5. Opportunities for further progress in the field of health education.

# CHAPTER III

## THE TEACHER'S EXAMPLE AS A FACTOR IN HEALTH EDUCATION

**Force of Example.**—Leaders in all movements should be living examples of the doctrines they advocate. "Example is better than precept" may be platitudinous, but it is profoundly true. Unless the teacher of health practices in her own life the principles she teaches, she cannot put into her instruction the force that comes from personal enthusiasm for the subject. Teaching demands physical fitness. Sympathy, patience, a sense of proportion, and enthusiasm are required of the teacher, and these qualities are found only in a body properly nourished and exercised. Upon physical well-being, too, are largely dependent poise, a sense of humor, and freedom from worry. The teacher must give of herself constantly. To replenish the springs of her influence she must preserve her health as a source of power. Accordingly, the teacher's first aim should be the proper safeguarding and development of her own health.

**The Teacher's Health.**—Though the physical well-being of the school child early attracted the attention of educational leaders, the health of the teacher responsible for the proper instruction of the child was for years sadly neglected. Even after educators became

aware of the importance of this problem, they failed to give it the study it merited. We would not appear to imply that the profession of teaching is in any sense a peculiarly unhealthful one. Alarmist statements made some years ago in regard to the health of school teachers, and particularly the prevalence of tuberculosis among them, were based on an erroneous interpretation of statistics. It was claimed that the ratio of tuberculosis deaths to total deaths from all causes was higher in the teaching profession than in the population as a whole. Later investigations have shown that the actual tuberculosis mortality of teachers is well below the normal rate and that the reason the ratio of tuberculosis deaths to total deaths among teachers is high is simply that the mortality of teachers from causes other than tuberculosis is even further below the normal than is their tuberculosis mortality. All in all, both the death rate and the sickness rate among teachers is far below the average of the corresponding rates for the general population at the same age periods.

In spite of these facts there is still much to be done before the teachers of the country as a class stand out before their pupils as the examples of splendid vitality which we should like to see set before the children. It is well, therefore, that many communities are today giving more attention to the physical condition of the teachers in their schools. In a recent bulletin, based upon extensive questionnaires, the Federal Bureau of Education in Washington shows that several states are investigating the living conditions and are safeguarding the health of their teachers by providing

modern buildings for their coöperative use. In a community in New York State the Teachers' Association and educational authorities are active in organizing social gatherings and out-of-door sports for the entire administrative, supervisory, and teaching staff. In one state a campaign is being conducted for the establishment of a "preventorium" to which teachers in the public schools may go for thorough medical examination, treatment, and recuperation at minimum cost. This state, in coöperation with its teachers, has provided a special cottage for tubercular teachers at a standard sanatorium.

Worry and anxiety over approaching old age and the expenses of sickness are important factors in undermining the health of teachers. To remove such health-destroying influences, some of the more advanced states are operating school pension systems, sickness insurance, and adequately paid sick leave, and are even beginning to pay their teachers a living wage. In a democracy such measures should gain the hearty support of the public interested in the efficiency of its school system and of its teachers.

It is necessary to do more than attempt restoration of health after it is gone. Progressive normal training schools and colleges of education give every entering student a thorough physical examination by competent physicians. In Connecticut the medical examination is required for all applicants for admission to the junior classes of the state normal schools. A uniform fee of $2.00 per examination has been approved and a traveling allowance of $.10 a mile will be permitted when it is necessary to bring a physician from another

city to make the examination. It is recommended that the medical examinations be started as early as possible in the spring, as soon as the applications are received, the educational prerequisites accepted, and the applicants' graduation from high school assured. Applicants are accepted, accepted on condition, or rejected. If accepted on condition, definite remediable defects are specified, and these must be corrected before the student is accepted in good standing, sufficient notice being allowed in which to remove this entrance condition.

Similarly many boards of education require every applicant for teaching positions to be given a thorough physical examination before receiving appointment. In those schools where there are school physicians and nurses the teaching corps should have the benefit of their services and their instruction in personal hygiene.

It is important to remember that the principle of systematic health examination, so thoroughly worked out in connection with the medical inspection of school children, is equally applicable and even more necessary, in the case of adults. Teachers, with this example before them, should be inspired to apply it in their own personal pursuit of health.

The first step in the acquisition of good health or better health is to find out exactly what is the present condition of your health. In other words, have a human appraisal. No good business man starts a new venture without an inventory as the first step. Any important undertaking must be preceded by a survey of conditions. That goes for the human system, too. It needs to be inspected at intervals by an expert. The only person com-

petent to make such a human inspection is, obviously, a physician. The health examination is, therefore, the initial procedure.[1]

It may be added that a health examination of this kind should be sought once a year by every individual if the maximum of vigor and effectiveness is to be secured. In the last analysis, however, the teacher must be the guardian of her own health. Periodical examination by competent physicians reveals danger points that can be corrected, but to keep her teaching efficiency at the highest point and to maintain her physical well-being, the teacher must devise and carry through some health program of her own—a program that applies the health principles she teaches.

**The Health Program.**—The teacher's health program cannot be a hit-or-miss sort of thing—a schedule of procedure to be used one day and neglected the next. A health program is designed to fit the teacher for all the demands made upon her both in and out of the schoolroom. It must constitute a real regimen of life in which body, mind, and spirit receive each their proper attention. It should include an annual medical examination, the correction of all remedial defects, and a well-balanced daily program for maximum attainment of physical well-being. A balanced day involves quiet meditation, inspirational reading, uninterrupted planning of activities, all-absorbing work, recreation, companionship of friends, out-of-door exercise, wholesome meals, and seven or eight hours of sleep.

**Recreation.**—Since a teacher's work is carried on largely within walls, outdoor recreation is essential in

[1] Dr. A. J. McLaughlin, *Personal Hygiene, National Health Council Health Series.*

her program of life. Outdoor exercise is needed to relieve the fatigue of indoor work. The daily walk to and from school, participation in outdoor sports, such as tennis and riding, deep breathing, calisthenics, and gymnasium exercises, will increase the muscular tone and help oxygenate the blood.

**Diet.**—In a well-regulated and healthy life few factors are more important than diet. The teacher who lives away from home will often find this problem an extremely difficult one; but she should make a special effort to apply in her own case the principles of dietary hygiene [1] and to obtain for herself not only a sufficient energy allowance but also an adequate supply of proteins, vitamins, and salts. As pointed out later on, meat consumption may well be reduced to as low a level as is consistent with the degree of palatability demanded by our usual habits; while ample use of fruits, vegetables, and milk should be emphasized. Water should be drunk in ample amounts and strict attention paid to regularity in the use of the toilet at the same time each day and preferably when one is not in a hurry.

**Fresh Air.**—The efficiency of the teacher, as well as of the pupils, will depend largely upon good ventilation of the schoolroom. The teacher should make it her personal care to see that the thermometer does not rise appreciably over 68° F. in the room for which she is responsible. At home, sleeping with open windows at all seasons of the year should form a part of the daily program.

[1] For discussion of sound dietary laws see Chapter VII.

**Rest.**—The nature of the teacher's work tempts her to overtax her strength and to become so much absorbed by the demands made upon her that she neglects an important source of power—*rest.* Sleep, complete relaxation, and entire change of activities should be considered not only part of her preparation for her work but a duty that she owes herself as a human being. The neglect of rest reacts upon her own health and upon that of her pupils.

**Clothing.**—The hygiene of clothing involves simply the common-sense rule of adjusting dress to season and place and work. One may wear loose, comfortable, sane clothing and yet be well dressed. Clothing that is so tight as to interfere with deep, full breathing or so binding as to restrict free movement of blood to all parts of the body is injurious and should never be worn. Furthermore, the clothing must be adapted to the weather and the temperature. In winter, woolens and heavy garments—sweaters, coats, woolen stockings, gloves—are necessary to retain body heat. For rainy, windy weather, garments impervious to moisture and rubber shoes for the feet are desirable. In summer, the rapid dissipation of body heat and moisture are the factors most necessary to comfort. Consequently clothing, light in weight and very porous, is recommended for warm weather wear and for indoor temperatures. Dark colors absorb heat; light colors reflect, rather than absorb it. The latter, therefore, are suitable for summer, the former for winter.

Physical exertion quickens the heart beat and raises the temperature. When indulging in muscular work, light-weight clothing should be worn, but extra cloth-

ing, such as coat or sweater, will prevent too rapid cooling after such work.

**General Health Habits.**—The same health habits that are outlined for children in the subsequent chapters of this book should carefully be observed by the teacher. In classroom and out, the teacher should cultivate habits of proper body carriage while sitting, standing, or walking. Bad posture and habitual neglect to give heart and lungs necessary freedom will injure them by interfering with their normal functioning. The result will be improper oxygenation of the blood, misplaced organs, cramped muscles, and general impairment of the entire physical tone. If the teacher will but follow conscientiously and regularly the health principles she endeavors to inculcate in her pupils, she will not only present a glowing and convincing argument for her instruction, but she will also reap the benefits of increased efficiency and general well-being.

### Topics for Investigation and Discussion

1. The first step in any successful program of health and physical education.
2. The essentials of a teacher's personal health program.
3. Community measures for safeguarding the health of teachers.
4. The most outstanding needs for the protection of the teacher's health.

perspiration [illegible] called

# PART TWO

## *CONTENT*

"Give me health and a day and I will make the pomp of emperors ridiculous."

—Emerson.

# CHAPTER IV

## THE LIVING MACHINE

**Objectives of Health Education.**—Health education, like every other kind of education, must be worked out in practice through the accomplishment of specific individual tasks—the mastering of this or that fact, the acquisition of this or that habit. As in other fields, however, there is always present the danger that details may so obscure perspective that we see only the trees and not the wood. If one thinks only of isolated facts and specific habits, life becomes dull and uninteresting. Routine performance of the day's round, without thought of the laws and tendencies which lie behind it, robs one of a good part of the joy of being alive. So it is with education; in order to keep the teaching of any subject really vital there must be a constant effort to hold main objectives in view, to realize to the full the significance of the ultimate results for which we are striving.

In the field of hygiene it is not the formation of individual health habits alone which is important, but also the cultivation of a health conscience which will lead to the formation and the continuance of good health habits in the future. The learning of specific facts in regard to the structure and functions of the human body is significant primarily as it contributes to the

basic conception of the body as a living machine, working in accordance with physical and chemical laws, and working as a coördinated whole, with the health of each part depending on the normal functioning of the rest. It is essential that this conception should be grasped, not as a form of words, but as a solid and vital basis of all the student's thinking about health. If such a view were held as a basic conviction by our people as a whole, most of the delusions and superstitions about health, and most of the quackeries that prey upon the human race in the name of such delusions would vanish like a dream.

**Health Teaching Founded on Biology.**—The development of this fundamental viewpoint in regard to the living machine depends in large part upon a sound conception of the broad principles of general biology. As President R. L. Wilbur of Stanford University has said, "There should be particular emphasis laid upon biological work—nature study, zoölogy, botany, and the like—as a basis for thinking in terms of life. Otherwise, hygiene is too apt to be a series of more or less true so-called 'precepts.' * * * The teachers need to think biologically more than to put over rules."

If we could really communicate to children the conception of the living machine, with all that it implies, we might almost be satisfied with the accomplishment of the course in hygiene. It is impossible, however, to teach this general lesson without a sufficiently detailed exposition of physiology to make its meaning a vital element in intellectual experience. We are cordially in agreement with the dictum in a recent outline issued by the Pennsylvania Department of Education that in

health education "only so much formal information should be given as will render possible good health in the parts described." But a certain amount of fundamental information is essential if the child is to be something more than an automaton who has acquired certain health habits as a pet dog might learn a trick. If he is to acquire a hygienic intelligence which will enable him to modify his habits to meet the changing conditions of life after school, and to deal competently as a citizen with the health problems which occupy every year a larger place in community life, he must really understand the human body and its workings and the factors which tend to interfere with or promote its normal health. The chief elements in this knowledge, which seem to the authors of vital importance, will be outlined in succeeding chapters; but it will be profitable, first of all, to discuss very briefly the bearing of certain of them upon the basic and fundamental conception of the living machine.

**The Mechanics of the Human Body.**—The first essential in our conception of the living body is that it is an organism made up of interdependent parts, each having specific functions to perform for the common good of the whole. Professor Sedgwick of the Massachusetts Institute of Technology used to tell of a student who was much surprised on her first dissection of an earthworm to find how many parts there were in its coelom. When she was asked what she expected, she replied, "Why, I thought it was just worm all through." The same error, in a less crude form, affects the attitude of many people toward their own bodies.

The teacher should, of course, keep in mind the fact that organs are in turn made up of tissues, and tissues of cells. In classroom instruction in hygiene, however, the main emphasis may well be laid upon organs, and the most direct way in which a conception of organization may be gained is by a consideration of the general structural framework of the living machine. The first step in an analysis of the structure of the body is a recognition of its broad anatomical division into head, trunk, arms, and legs and an explanation of the fact that while the head is largely a mass of nerve tissue enclosed in a bony case and the limbs more or less solid masses of bone and muscles, the trunk contains two hollow spaces, the thoracic cavity above the diaphragm and the abdominal cavity below it, which are not completely filled by the numerous organs of respiration, circulation, digestion, and the like which are located in them (see Fig. 2).

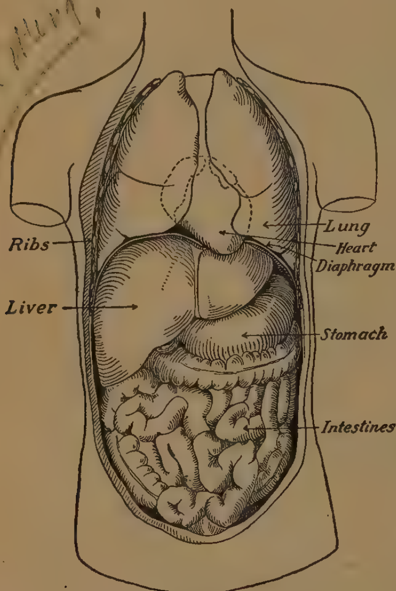

FIG. 2.—The position of some of the principal organs of the body.

The mechanical framework of the whole body con-

sists of the bones, enclosing the softer organs as in the case of skull, ribs, and pelvis, or supporting them as central rods in the case of the spinal column and the bones of the extremities. Rigidity is combined with flexibility by the arrangement of the skeleton in separate individual bones, attached to each other at joints permitting various degrees of motion according to the needs of the part in question.

Next there will naturally come a consideration of the way in which the muscular system is related to the skeleton, which would fall over if it were not held together by the sheets and bands of muscle which are connected with it. Furthermore, all the obvious movements of the body are made through the contraction of muscles attached at either end to bones or to other tissues, whose relative positions they change when they shorten. A brief consideration of these two systems of organs, skeletal and muscular, gives the pupil his introductory conception of the mechanics of the living machine. It is not at all important to learn the number and names of the bones and muscles; but it is essential that the child should comprehend the general structure and interrelationship of the bony and muscular systems if he is to have an intelligent grasp of what is involved in correct posture, if he is to comprehend the real value of exercise, and if in future life he is to respond intelligently to the professional advice of the orthopedist.

**The Chemistry of the Body.**—The first fundamental conception of physiology is that the body is a mechanical structure, obeying physical laws. The second is that the processes of life are based upon the oxidation

of complex organic substances in accordance with the laws of chemistry. Not only the activity of the muscles of voluntary movement, but the innumerable motions of the heart, lungs, and other internal organs and the countless chemical processes which go on in every living cell require energy for their consummation. This energy is derived from the oxidation of the food, and is the source of the work performed and of the heat liberated in daily living.

The food needs of the body are conditioned, first of all, by the amount of energy required for the performance of its daily tasks and, second, by the specific kinds of building materials essential for the repair of the constant breakdown inherent in the life process, and, in youth, for the excess of repair over waste which makes growth possible. For these purposes we must obtain foods in the proper amount and of the proper kinds and these foods must be prepared for the use of the body by the process of digestion, which changes them into a soluble form suitable for absorption through the walls of the alimentary canal.

Of equal importance is the supply of oxygen, which by its union with oxidizable materials liberates the energy characteristic of that peculiar type of combustion we call *life*. As we derive our body fuel from the digestion of food in the alimentary canal, so we derive our oxygen supply from the air drawn into the lungs.

Food materials from the intestine and oxygen from the lungs must be carried to all the tissues of the body by the machinery of circulation. The heart by its beat keeps the life-giving stream of blood pulsing

through every organ day and night, year in and year out; but the function of the blood is a dual one. The life process results in the constant formation of waste products which would prove poisonous to the tissues if not promptly removed. The removal of these waste products by the blood is as important as the supply of food and oxygen; and their final elimination through the lungs, skin, kidneys, and other organs of excretion is an essential part of the working of the living machine.

It should be noted in connection with the topics which have just been discussed that a knowledge of the mechanics and chemistry of digestion is vital to the continued maintenance of sound alimentary habits, while only a real knowledge of the elements of nutrition will make possible a judicious appraisement of the dietary fads and fancies with which the citizen of the future is likely to be confronted in increasing degree. A knowledge of the ways in which wastes are eliminated from the body is fundamental in avoiding constipation and in maintaining the kidneys in a healthy condition. Here, again, it is only through a real knowledge of the nature of the processes involved that the individual will be disposed to take the fullest advantage of medical counsel bearing on the postponement of the degenerative diseases of later life.

**The Coördinative Machinery of the Body.**—Finally, the pupil must be brought to realize the extraordinary complexity of the processes by which all the activities of the body are kept in harmonious interaction. The way in which the eye and ear record what is going on in the outer environment illustrates how these activities

must be continually modified to meet changing external conditions. The internal coördinations necessary, in even such a simple act as walking, and the changes in respiration and heart action which follow physical exertion exemplify the complexity and beauty of the vital processes, and the way in which the central nervous system serves as a directive center for the interchange and correlation of the messages which come in and go out by way of the nerves. A knowledge of the mechanism of reflex action is essential to a sound attitude toward mental hygiene, and a concept of inhibitions is basic in the cultivation of habits of self-control.

We are inclined to believe that a discussion of these broad and elementary principles of physiology can be introduced to advantage at the very commencement of the course in hygiene, to serve as a preliminary outline of its major objectives and a guidepost for their attainment during the detailed consideration of organ systems and health habits which is to follow.

### Topics for Investigation and Discussion

1. The objectives of health education.
2. The contributions of biology to health betterment.
3. The debt of modern health to chemistry and physics.
4. The human body as a machine.
5. The human body as a combustion engine.

# CHAPTER V

## PHYSIOLOGY AND HYGIENE OF POSTURE

**Old and New Ways of Studying the Skeleton.**—In the old days of formal physiology the memorizing of long lists of bones was one of the very dullest phases of a generally profitless and uninspiring course of study. A natural reaction against this over-emphasis on anatomy has led many teachers to regard the whole problem of skeletal structure with aversion and to omit as far as possible any reference to it in the course in hygiene. Yet a general knowledge of the skeleton and its function in the body is vital to a sound conception of the living machine as a whole. A physical framework is the first essential in the building of any mechanism. The manner in which the bones are constructed and related, so as to combine strength and lightness, rigidity and flexibility, drives home the idea of biological adaptation with compelling force. This can be done with special success, if the subject be discussed from a comparative standpoint, pointing out the varying degree in which the same fundamental ends are realized through external or internal skeletons or both, in molluscs, insects, turtles, and other forms.

Above all, however, the discussion of the skeleton should be directly correlated with the problem of posture. There is a field of practical hygiene corresponding to each important phase of physiology. The importance of holding the body well can be most

effectively taught through discussion of its physical framework.

**The Chemistry of the Bones.**—Even before considering the various forms of the bones it will be well to discuss briefly their chemical composition, since such a consideration gives the child at the outset an illuminating vision of the value of certain important health habits. The essential facts to emphasize are that the bones consist chiefly of lifeless matter, about one-third of organic (fatty) nature and two-thirds of mineral materials. It is helpful to demonstrate the organic and inorganic constituents by the classic experiment of heating one bone for a long time in the fire and treating another with strong acid. The first will contain only inorganic lime and will be so brittle that at a touch it falls into powder. The second, on the other hand, will have had its lime so fully dissolved out that it can be bent and tied in a knot.

This experiment, either demonstrated or merely described, leads up to a discussion of the development of the bony system. Bone is a secretion formed by the bone cells, first fibrous in nature, then frequently passing through the stage known as cartilage, and finally hardened into true bone by the deposit of lime. Soft cartilage persists at such points as the surfaces of many joints and in the septum of the nose; but true bone is almost a solid mass of lime with the living cells scattered here and there within it. It is because the bones of a young person contain more living matter that they are somewhat flexible; while those of an old person, with relatively more lime and less living matter, are easily broken by a fall.

It will be obvious that an adequate supply of calcium in the diet is essential for the upbuilding of the bones in a child's body, and the vital importance of milk as a source of calcium can be strongly emphasized. With older children one may go much further and discuss rickets, the most frequent disease of the skeletal system—a disease not due primarily to a deficiency of lime but to the inability of the body to use its lime properly. This disease, characterized by a lack of proper balance between lime and phosphorus, can be cured by the administration of cod liver oil, which regulates the metabolism[1] of these salts, a fact which illustrates how complex are the interactions of various foods and how great is the need for a balanced diet. Furthermore, rickets can be cured or prevented in what appears at first to be quite a different way, by exposure to sunlight or ultra-violet rays. This gives us a clue to the hygienic value of sunlight and the outdoor life.

**The Forms and Adaptations of the Parts of the Skeleton.**—The human skeleton includes about two hundred separate bones, twenty-eight in the head, some fifty in the trunk, and about thirty in each of the limbs. The general relations of the skeletons of the trunk and of the limbs and the adaptations of each bone to its particular function is a fascinating subject of study (see Fig. 3). The skull, or cranium, with its eight bones, firmly joined together by jagged, interlocking edges like a mortise and tenon joint, illustrates the protective function of the skeleton carried to the highest degree. The twelve pairs of hoop-like ribs

[1] Process by which living matter is built up out of food materials and then broken down into simpler substances again.

forming a sort of cage about the heart and lungs, attached to the spinal column at the back and (in the case of the first ten pairs) to the sternum or breastbone in front, accomplish the same end of protection

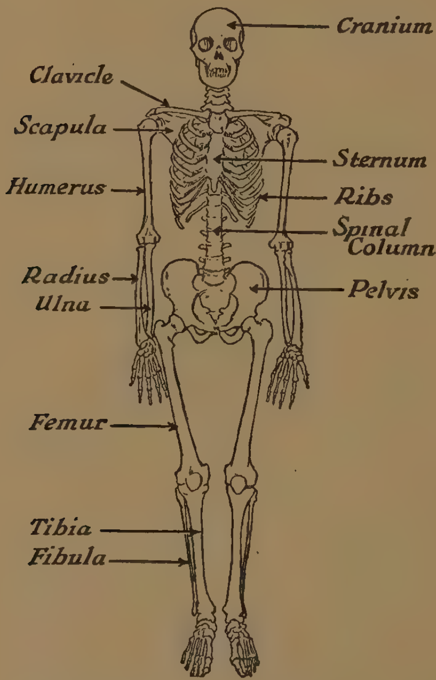


Fig. 3.—The framework of the body.

in a different fashion. The spinal column itself and the bones of the arms and legs illustrate another principle, the strengthening of a region of the body by a central bony axis.

A knowledge of the structure of the backbone is particularly helpful as a basis for good postural habits. It is built up of twenty-four distinct and separate ring-shaped bones, the vertebrae, piled one upon another to form a slender column, with nine or ten smaller bones in addition, more or less completely fused together at the lower end. Through the center of the vertebral rings runs the spinal column, and on each side and at the back these rings bear prongs or teeth to some of which the ribs are attached. Looked at from the side the spinal column is curved slightly into a suggestion of an S shape, an arrangement conducive to resiliency. The individual vertebrae are separated by cushions of cartilage and bound together by small muscles and ligaments. When the muscles on both sides pull with equal force, the body is held erect. When those on one side contract and those on the other side relax, the vertebrae tilt slightly on each other and the body bends. If one of the vertebrae slips slightly out of place, pressure results on the nerves which pass out from the spinal column between the vertebrae, and painful and disabling conditions may follow.

In considering the bones of the limbs it is interesting to note the almost exact parallelism between the skeletal structures of arms and legs. The bones of the arm are attached to the large broad shoulder blade, scapula, and the clavicle, or collar bone, a delicate bone often broken in a fall. The bones of the leg are attached to the broad, bowl-shaped pelvis which supports the organs of the lower abdominal cavity. The upper limb is supported by a single long bone (the humerus in the

arm, the femur in the leg); the lower limb by a pair of long, parallel bones, the radius and ulna running from elbow to wrist, the tibia and fibula from knee to ankle. The complex movements of wrist and ankle are made possible by a group of eight small bones in the former and seven small bones in the latter case. In the palm of the hand and the instep of the foot there are five parallel bones which connect with rows of two or three bones in each finger and toe.

Bone is remarkably strong, twice as strong as oak wood, but at the same time highly elastic. Many of the larger bones, such as the humerus of the arm and the femur in the leg are constructed in the form of hollow cylinders. This affords a maximum of strength with a minimum of weight. In the interior of such hollow bones lies the soft, fatty marrow, a tissue which serves an important function as a site for the manufacture of the red blood corpuscles.

**The Movements of the Skeleton.**—Some of the bones, like those of the skull, are fixed more or less firmly to each other; but in most cases they are merely bound together by ligaments which allow for movement in certain definite directions. A sprain is due to the tearing of these ligaments.

A brief consideration of some of the more important kinds of joints in the skeleton is particularly helpful in emphasizing the conception of the human body as a machine. The tilting of the vertebrae when the body is bent illustrates a rudimentary kind of joint movement. The elbow and knee offer examples of a second type of joint, called a hinge joint, in which one bone moves freely on another, but only in a single plane, like

the blade of a jackknife. The joints at the shoulder and at the top of the thigh permit a still greater freedom of movement. This type is called a ball-and-socket joint, because one of the bones has a rounded knob, or ball, which moves about in a cup, or socket, of the other. Finally at wrists and ankles we have what are called gliding joints, in which a number of small bones move or glide over each other permitting great variety of movement.

Certain of the more important joints are enclosed in little bags of ligament filled with a liquid which keeps the ends of the bones wet so that they can move with the greatest freedom over each other, somewhat as we oil the hinges of a door to keep it from creaking.

**The Hygiene of Posture.**—All this consideration of skeletal structure has two principal aims in view, to emphasize the mechanical element in the body and its complexity of adaptation and to lead up to an effective teaching of postural hygiene. The development of the individual bones depends on diet and to a certain degree on sunlight, but the management of the skeletal system as a whole is conditioned on the way in which its parts are held by habits of posture. With the same equipment of bones one child may be stoop-shouldered and slouching, another erect and well-knit. The effects of bad posture may be far-reaching in their influence on health. If the back and shoulders are not held properly, the internal organs will be pressed together and robbed of their proper supply of blood. If the muscles of the lower abdominal wall are allowed to sag, the organs of the abdomen will get out of place and more or less fundamental damage may result.

It is in childhood that these problems are most important, since if the muscles develop unequally it becomes increasingly difficult to bring them back to normal.

When standing, the head, body, and legs should be poised one above the other, so that a line dropped from the front of the ear would fall within the forward half of the foot. The shoulder blades should be flat across the back and the feet directed forward and parallel to each other. In sitting, the body should be bent only at knees and hips, and the head, neck, and trunk should be kept in one straight line.

Among the things which interfere with good posture are the wearing of tight and cramping clothing, and the habitual carrying of a heavy weight, such as a pile of school books, on one arm. Above all, however, the teacher should regard it as a fundamental part of her duty to consider the adaptation of school seats and desks to sitting posture. Sitting at a desk which is too low or too near the seat not only causes round shoulders but also encourages a twisting of the backbone to one side or the other which may lead to curvature of the spine.

Serious orthopedic defects are found in more than one per cent of our American school children. Of these the commonest are: (*a*) stoop shoulders and flat chest, (*b*) lateral curvature of the spine, (*c*) bowlegs and knock-knees, (*d*) lameness, and (*e*) flat foot. Bowlegs and knock-knees are commonly symptoms of deficiency in diet during earlier years, and most cases of hip disease, hunchback, and paralysis are due to bacterial infections, frequently tubercular in nature.

Round shoulders and spinal curvature, on the other hand, are generally caused by bad postural habits, often fostered by ill-arranged school seats. Where possible, the seats should be adjusted so as to avoid strains of this kind. Where they are not adjustable, a wooden support may be screwed under desk or chair so as to raise one or the other to fit the pupil's needs.

**Hygiene of the Feet.**—The healthy foot is one of the most essential elements in good postural hygiene. The normal foot has a well-marked arch under the instep so that the wet sole, as one steps out of the bath, for example, should leave a full impress only at the front and back. When this arch is broken down, as in the deformity known as flat foot, the nerves and blood vessels beneath are injured and walking becomes painful. Not infrequently pains extending far up the back may be caused by the resulting strains. The maintenance of the healthy arch depends in large part on the activity of the muscles which move the toes and which also serve to hold the arch in place. Tight shoes, which cramp these muscles and lead them to degenerate, play an important part in causing broken arches, in addition to their more immediate effect in producing corns. A hygienic shoe should be everywhere as wide as the sole of the foot and wide enough in front to permit the toes to move freely. The inner edge of the shoe should be straight, so that a line drawn back from the middle of the great toe touches the heel. The heels should be low and broad. The soles and uppers should be flexible, so that the foot may be bent freely. A high shoe should not be so tightly laced at the top as to interfere with circulation.

A porous shoe, like one made of russet leather, is much better than an enamel or patent-leather shoe, because it allows the escape of moisture and prevents overheating the foot.

**Psychology of Posture.**—Throughout the consideration of problems of posture the important fact should be emphasized that physical and mental states are often correlated to a striking degree. When a boy carries himself like a soldier, he begins to feel like a soldier. When a girl holds herself like a queen, she begins to feel like a queen. Ease and courage and success are associated with good posture, as awkwardness and cowardice and failure are associated with physical slouching.

### Topics for Investigation and Discussion

1. The relations between the protective and the movement functions of the skeleton.
2. Correct posture as habit formation.
3. Bone formation in youth and in age.
4. The spinal column and its relation to health.
5. Orthopedic defects observable in the pupils of the local schools.
6. The foot and its relation to health.
7. The psychology of posture.

Nervous
Vascular
Circulatory
Skeletal
Muscular
Respiratory
Glandular
Excretory
Reproductive
Digestive.

# CHAPTER VI

## THE HYGIENE OF EXERCISE

**Form and Structure of the Muscles.**—There are some five hundred separate muscles in the body and they make up about one-half of its total weight. Their names are of no moment in the teaching of elementary hygiene, and only a few general points need be considered in regard to their varying forms. It should be pointed out that they range in size from such tiny muscles as move the eyelids to great muscles in the back which weigh several pounds. The general form of the big spindle-shaped muscles of legs and arms and of the great sheets of muscles which give form to the front and back of the trunk should be illustrated by reference to a good chart or textbook picture (see Fig. 4).

The inner structure of the muscle should be briefly described, so as to make clear that each muscle is built up of a great number of tiny muscle fibers, each an inch or so in length and $\frac{1}{250}$ to $\frac{1}{2500}$ of an inch thick and about the shape of a long leather shoe string. Each of these fibers has the power of becoming shorter and thicker. When these muscl efibers contract, the muscle as a whole contracts also.

**How the Muscles Act.**—The mode of action of the muscles can be illustrated by a single concrete case, but this single case should be fully explained. First of all, it should be recalled that the muscles are usually

connected with the bones by means of tendons, tough fibers like those with which we are familiar in the drumstick of a chicken. The working of the tendons in the back of one's hand may be seen very clearly as the hand is opened and closed. It will be obvious that this arrangement avoids complications which would result from the extension of bulky muscles directly to the points of ultimate attachment. The biceps muscle of the arm affords perhaps the best illustration of the general machinery of muscular action. It lies above the humerus, attached at one end to the bones of the shoulder and at the other to the bones of the forearm. When this muscle contracts, as one can feel it contract by placing the left hand over the right upper arm, the forearm is necessarily pulled upward; and when we straighten the arm again the forearm is pulled down by another muscle, the triceps, running in similar fashion from shoulder to forearm but on the under side. When the biceps contracts the triceps relaxes and vice versa.

FIG. 4.—The muscular system.

This is a good illustration of what is called antagonistic action, a principle involved wherever the parts of the body are held in position by a balanced pull between two opposing sets of muscles. The vertebrae are constantly held in place in this way, and the whole erect posture of the body is made possible only by continuous muscular action. When we are standing or even sitting still, the muscles of the body are always more or less active.

Furthermore, it must be remembered that besides the muscles attached to the skeleton (called voluntary muscles, because we can cause them to contract at will) there are a great many other muscles in the body which we call involuntary muscles. Examples of involuntary muscles are the heart muscles and the tiny muscles which line the blood vessels and the walls of the alimentary canal, muscles which are constantly at work, whether we are waking or sleeping, so long as life goes on. The daily work of the heart muscle alone is said to be equivalent to the lifting of a hundred-ton weight a distance of one foot. Voluntary muscles and heart muscle are striated, or striped, a characteristic which depends on their internal structure. The involuntary muscles of the intestines and blood vessels lack this characteristic and are called non-striated. non-striated

**Muscular Exercise in Relation to the Health of the Body.**—It is comparatively easy to convey to the young people of the present day a realization of the direct and immediate value of exercise in developing the muscles themselves and to make them realize that unused muscles tend to atrophy, while muscles which are strengthened by use show increasing progress in

power and grace. It is also desirable, however, to emphasize the fact that muscular exercise contributes to the health of the whole body in diverse ways, so that there may be a motive for maintaining habits of exercise after the days of football and basket ball are over. Among the more important influences of muscular exercise upon general health the following deserve special mention: the stimulation of the heart and blood vessels; an increase in depth and rate of respiration; the elimination of waste products from various tissues which follows increased circulatory and respiratory activity; the stimulation of the digestive organs; and particularly the lessened tendency toward constipation. The human machine was originally evolved under conditions of active physical exercise. It is built for such conditions and can maintain a maximum of health only when these conditions are provided.

**Essential Types of Exercise.**—The body needs various kinds of exercise for different specific purposes. Walking in the open air is good, and everyone would do well to spend an hour a day in this way. It is essential, however, to secure a certain amount of more vigorous exercise than can be obtained by walking—exercise that will cause the heart to beat more quickly and the lungs to do their fullest work. One may walk five miles a day and yet be in poor physical condition. The adoption of a routine series of setting-up exercises is an invaluable corrective of the sedentary life.

The best exercise, however, is that which is obtained in the form of games, since good games not only supply a mental stimulus which makes muscular exertion easy but train the eye and the brain and the character

as well as the muscles. This side of the school child's life is receiving constantly increasing attention nowadays. Perhaps the teacher herself is more in need of reiterated emphasis on the importance of tennis, skating, swimming, riding, and the like as adjuncts to healthy living.

### Topics for Investigation and Discussion

1. Structure and function of the muscular system.
2. Exercises and games as muscle builders.
3. The effects of fatigue upon the muscular system.
4. The biological importance of muscular exercise.

# CHAPTER VII

## THE HYGIENE AND PHYSIOLOGY OF NUTRITION AND DIGESTION

**Health, Growth, and Nutrition.**—The new and vitalized type of health education developed in recent years has been built around the conception that the growth of a child is an approximate index to its health and that adequate nutrition is a primary essential for both growth and health. The "scale in every school" and the use of the height-weight chart as a device for interesting the child in its physical well-being have become basic elements in our modern plan.

Both of the two fundamental assumptions involved in this conception have been vigorously criticized and with much justice. The growth curve of a child has definite seasonal fluctuations which cannot be disregarded. From 50 to 60 per cent of the total growth of the year is made in the months from August to November. The accepted standards of weight in relation to height and age are admittedly imperfect, particularly as applied to certain foreign stocks in our population, for which height-weight ratios different from those of northern European races appear to be characteristic. Clark has shown that perfectly normal and healthy children may show a considerable proportion of individuals with a height-weight ratio more than 10 per cent below the usual standards. Dublin and Gebhart

report in a group of children of Italian stock a large number found by clinical examination to be undernourished but with high height-weight ratios. Even when real malnutrition exists, it must always be borne in mind that the cause may lie in some undetected physical defect and not in a deficient food supply.

Nevertheless we are, on the whole, convinced of the fundamental soundness of the approach to health teaching through a consideration of height-weight studies. No doubt, as time goes on, standards will be corrected and defined; but even the present standards do pick out in the most convenient manner at our disposal a large proportion of those children who need special attention. The scientist is correct in emphasizing that underweight as compared with some arbitrary standard does not necessarily prove that a given child is undernourished. The practical administrator is also right in maintaining that a simple procedure like weighing and measuring, which selects for us at a glance even 50 per cent of the children who should be carefully examined for physical defects and faulty dietary habits, is an instrument of real value.

Furthermore, the weighing and measuring campaign and the schoolroom charting of its results have proved an excellent psychological approach to the whole subject of health habits and an invaluable aid in interesting the child in the problems which concern his own personal health. Furthermore, it emphasizes the positive aspects of physical vigor and effectiveness rather than the negative aspects of the avoidance of disease. In the lower grades this may well be made the fundamental approach. In the higher grades we believe that a

general conception of the human body as a living machine, to be gained from a study of the skeletal and muscular systems, should be attempted first. This will lead to a consideration of the energy requirements of the vital engine and how these are met in nutrition.

**The Energy Needs of the Body.**—It is, first of all, vital for a sound understanding of nutrition to grasp the conception of the calorie. A calorie is that amount of heat energy necessary to increase the temperature of one kilogram of water one degree Centigrade, a unit of measurement as definite as the inch or the pound. This concept should be made concrete and tangible by the demonstration to the class of typical 100-calorie portions, such as one large egg, two medium slices of white bread, one large banana, a restaurant serving of butter, two-thirds of a glass of milk, a dozen double peanuts, or one mutton chop.

To keep the body in healthy condition there is needed approximately the calorie supply indicated below, according to Sherman. The amounts should be increased if vigorous muscular work is done. Thus, in a six-day bicycle race the energy actually consumed may amount to 10,000 calories a day.

Average Calorie Requirements for Children of Various Ages

| | Years | Calories per day |
|---|---|---|
| Children | 1– 2 | 1000–1200 |
| Children | 2– 5 | 1200–1500 |
| Children | 6– 9 | 1400–2000 |
| Girls | 10–13 | 1800–2400 |
| Boys | 10–13 | 2300–3000 |
| Girls | 14–17 | 2200–2600 |
| Boys | 14–17 | 2800–4000 |

Next, there should naturally follow a consideration of the problem of the cost of a given calorie value when various foods are purchased, indicating how intelligent selection of foods aids in securing an adequate diet at minimum expense. Tables of calorie values per pound, such as are reproduced in Appendix I, will make it possible for the children to make inquiries as to the current prices of various foods and to compute calorie costs under existing local conditions. This will lead to a recognition of the essential importance of the cereals, sugar, dairy products, and pork products as cheap sources of energy and the relative costliness of meat, eggs, vegetables, and fruits. The special values of the latter foods for other purposes will of course be emphasized later on. There are excellent opportunities here for correlation with geography and for a consideration of the part played in human civilization by the great grain crops, wheat, corn, and rice. So far as the United States is concerned, according to Raymond Pearl, 91 per cent of our total calorie supply is derived from the following nine foodstuffs and 70 per cent of it from the first four on the list.

| FOODSTUFF | PERCENTAGE OF TOTAL |
|---|---|
| Wheat | 26 |
| Pork | 16 |
| Dairy products | 15 |
| Sugars | 13 |
| Corn | 7 |
| Beef | 5 |
| Oils | 4 |
| Potatoes | 3 |
| Poultry and eggs | 2 |

**Qualitative Essentials of the Diet.**—The supply of energy is of course only one side of the question. The tissues are constantly breaking down in the course of the vital process, and this waste must be made good by an equally constant repair. In childhood there must be an excess of repair over waste that will allow for growth. The importance of a supply of the specific building stones necessary for the growth of the body must, therefore, be constantly emphasized in the teaching of nutrition.

In the ordinary analysis of foods a rough classification is commonly made under the headings, water, proteins, carbohydrates, fats, and salts. It may well be pointed out in this connection that the human body itself is about 70 per cent water, and that water makes up 85 per cent of milk, 60–70 per cent of beefsteak, and 35 per cent of bread. A broad distinction may be drawn between carboyhdrates,—cereals, sugar, most vegetables, and fruits; foods which supply protein—meat, fish, milk, peas, and beans; and foods which provide fats,—fat meats, egg yolks, cream, butter, and nuts. The essential food elements which should be particularly emphasized are, however, proteins, salts, and vitamins.

In order to obtain an adequate supply of protein building materials the average adult will need about 50 grams of protein a day. The protein foods should, in general, supply from 10 to 15 per cent of the total calories in the diet. The proteins, however, constitute a group of diverse substances. The body needs not only a sufficient total amount of protein, but also proteins of the proper kinds. Milk and eggs contain

what are called complete proteins, sufficient by themselves for the support of life. On the other hand, such proteins as those which are most abundant in cereals are incomplete and must be supplemented by proteins derived from other foods.

Of the principal elementary substances which make up the human body, fats and carbohydrates supply only carbon, hydrogen, and oxygen, while in proteins, nitrogen and sulphur are also present in considerable amounts. At least seven other elements—calcium, phosphorus, potassium, sodium, chlorine, magnesium, and iron—form definitely measurable proportions of the human body; while still other elements are necessary for health. The lack of iodine in the water and foods of certain regions causes the prevalence of goiter. It has been shown that 1.44 grams of phosphorus, 0.67 gram of calcium, and 0.015 gram of iron are essential daily requirements in normal nutrition. The lack of calcium is a particularly common deficiency in the American dietary. For the supply of phosphorus, cheese, nuts, dried beans, whole wheat, and oatmeal are particularly valuable per unit weight; for calcium, cheese, almonds, dried beans, and milk; for iron, dried beans and peas, whole wheat, almonds, lean beef, oatmeal, and spinach.

The vitamins are substances, of still undefined chemical composition, present in certain foods in proportions far too small to be detected by analysis but essential to health, as has been discovered by experiments on the feeding of animals on diets adequate in calorie value, proteins, and salts but lacking these mysterious auxiliary substances. At least three well-

defined groups of vitamins are known. One group, best supplied by fruits and vegetables, prevents the development of scurvy; another, found in the husks of grains and in yeast, prevents the development of beri beri and other diseases of the nerves; and a third vitamin, particularly abundant in the fat of milk and eggs and in the leafy parts of certain plants, exerts a specific influence on the growth of the body.

In addition to the various essential food elements which have been enumerated, it should be pointed out that the maintenance of health also demands the inclusion in the diet of a certain amount of indigestible material. The cellulose derived from coarse vegetable foods serves to stimulate the intestines and keep the bowels open.

**The Basis of Sound Dietary Habits.**—Inadequate nutrition, unless due to some definite diseased condition, depends either upon inability to purchase the necessary foods or upon a badly cultivated appetite which leads to one-sided selection. A general deficiency in total food value occurs in families with a very restricted income, but lack of salts and vitamins is not infrequently found where no such economic pressure exists. The teaching of dietary hygiene should tend to cultivate an appetite for a balanced diet and to indicate how this appetite can be satisfied at a minimum cost.

The average American diet is unnecessarily wasteful in its over-emphasis on meat. The chief teachings of sound dietary hygiene may be summarized in the recommendation to eat less meat, to eat more vegetables and fruits, as sources of salts and vitamins, and,

3
above all, to drink more milk, as a source of complete proteins, salts, and vitamins. The average consumption of milk in a community should be at least one pint per person per day, and the growing child should have one quart of milk a day. This estimate, of course, includes the milk used in the preparation of foods as well as that used for drinking.

Miss Lucy Gillett [1] presents the following helpful list of the most important foods which supply each of the main essentials of the diet.

| ENERGY | PROTEINS | MINERAL SALTS | VITAMINS |
|---|---|---|---|
| Fats | Milk | Milk | Milk |
| Oils | Meat | Eggs | Eggs |
| Grain products | Legumes | Vegetables | Vegetables |
| Milk | Nuts | Fruits | Fruits |
| | Whole-grain cereals | Whole-grain cereals | Whole-grain cereals |
| | Cheese | | |
| | Fish | | |
| | Eggs | | |

It will be noted that grain products and milk occur in all four columns, eggs in three columns, and vegetables and fruits in two columns, a fact which well illustrates their relative importance.

The best way to make the dietary problem concrete is perhaps by a consideration of the proportion of the total food budget of the family which is spent for each

[1] *Food for Health's Sake.* National Health Council Health Series.

particular group of foods. The tabular statement below presents an approximate view of the way in which the average American food budget is divided and of the way in which it should be divided, in order to secure a well-balanced diet at minimum cost. It will be noticed that, under the ideal plan, about 25 per cent of the budget is spent for milk and another 25 per cent for vegetables and fruits against less than 15 per cent for meat, fish, and eggs.

Apportionment of the Food Budget

| FOODS | PRESENT AVERAGE PERCENTAGE ALLOTMENT | IDEAL PERCENTAGE ALLOTMENT |
|---|---|---|
| Meats and fish | 34 | 11 |
| Eggs | 6 | 5 |
| Milk | 10 | 26 |
| Cheese | 1 | 3 |
| Fats | 9 | 10 |
| Sugar | 4 | 3 |
| Grain products (bread cereals) | 17 | 15 |
| Vegetables and fruits | 15 | 25 |
| Miscellaneous | 4 | 2 |

The following table of foods for breakfast, dinner, and supper, adapted from "Suggestions for a Program for Health Teaching in the Elementary Schools," *Health Education Bulletin No. 10*, United States Department of Interior, 1922, contains material that will prove helpful in planning well-balanced meals.

*For breakfasts:*

Cocoa. Milk makes muscle and bone and gives vitamins for growth. (1 pint of milk every day.)

Toast.

Cereals. (Oatmeal and Wheatena.) Cereals should be cooked a long time—three to four hours in a double boiler, or, better, overnight.

Eggs. (Soft and hard cooked, dropped, scrambled.) Eggs, like milk, make muscle and bone and give vitamins. They also contain iron for healthy red blood. Eggs should always be cooked slowly.

Creamed Codfish and Creamed Beef.

Apple Sauce, Prunes. The inside of the body should be kept as clean as the outside. It is not clean inside if it is clogged up with waste. A bowel movement every day keeps it clean. Fruits contain cellulose, mineral salts, and acid, which make them good regulators.

*For dinners:*

Milk Soups. (Tomato bisque, spinach soup.)

Potatoes. (Mashed, riced, boiled, baked.) A starchy vegetable, therefore giving heat and energy. Mineral salts close under skin of the potato. To retain mineral, cook with skins on. Cook in boiling salted water, covered. After draining off water when done, hold over fire and shake to drive off steam.

Vegetables. (Spinach, carrots, onions.) Spinach and carrots give much iron and vitamins.

Meat Loaf. Meat, like milk, is a builder, but it is not nearly so good and it costs a lot more. Eat less meat. Drink more milk.

Desserts. (Baked custard, junket with soft custard sauce, chocolate bread pudding, brown sugar tapioca.)

| | |
|---|---|
| Eggs plus milk—Custards<br>Milk—Junket | Building foods. |
| Bread plus sugar and cocoa—Pudding<br>Tapioca (starch plus sugar)—Tapioca pudding | Heat and energy foods. |

In choosing the dessert look over the meal and see what foods have been planned. If the menu contains items that give heat and energy, choose a building dessert. If there are regulators and builders in the first parts of the meal, choose a heavier heat and energy giving dessert.

*For Suppers:*

Spaghetti and Macaroni. (Baked with cheese or baked with tomato.)

Salads. (Potato, vegetable, very ripe banana and nut; boiled salad dressing.) Salads are cool and inviting in summer, and if made of the right foods give, though cold, the heat and energy and building foods needed in summer.

Gingerbread. Gives energy and heat because it is made of flour, and it also contains molasses, which is a good regulator.

Sugar Cookies.

*Extras:*

Milk Sherbet. Made from milk with just lemon juice and sugar added. Another way to get in your milk, even if you do not like to drink it.

Candies. (Stuffed dates, chocolate-dipped nuts and raisins, puffed-rice candy.) Candy takes away appetite for good, better-balanced food if eaten between meals. Eat it after meals. Homemade candy is best.

Picnic. Stuffed-egg, date, and peanut butter sandwiches; prune and cream cheese sandwiches (with graham bread); lettuce sandwiches (boiled dressing); sugar cookies; milk sherbet; fruit.

From the standpoint of the cultivation of a normal appetite, special effort should always be made to develop in the child a taste for milk, for green vegetables, and for fruits.

**The General Structure of the Digestive System.**—After the proper diet has been selected, it must be made

available for the use of the body by the process of digestion. The food must be physically broken up by the teeth and by the churning action of the stomach; and it must be brought into soluble forms, which can be absorbed from the intestines through the action of the digestive juices. This involves the breaking down of the large and complex molecules of proteins, carbohydrates, and fats into smaller and simpler ones. A general knowledge of the structure of the organs of digestion and of the way in which they act is essential to the formation of sound health habits.

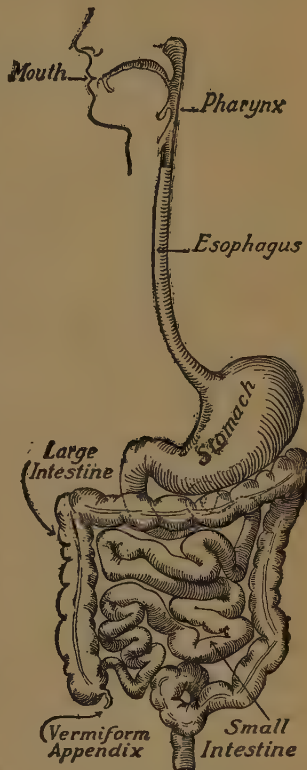


FIG. 5.—The principal parts of the digestive system.

The alimentary or digestive canal is essentially a single tube running through the body, larger in some parts and smaller in others, and with various special organs tributary to it (see Fig. 5). It is divided into six main regions, as follows:

(*a*) The mouth with its grinding and cutting teeth, and its salivary glands, discharging a secretion which moistens the food and contains a starch-digesting enzyme. (The position of these glands is unpleasantly

revealed by an attack of mumps which causes them to swell up and become painful.)

(*b*) The pharynx, at the back of the mouth.

(*c*) The long slender esophagus, down which the food is shot rapidly by the muscular act of swallowing and from which it is squeezed into the stomach by the contraction of muscles in the walls of the esophagus itself.

(*d*) The stomach, a large pouch holding about one quart in a grown person. Its walls contain strong muscles which help to break up the food and mix it thoroughly and which force it against the outlet into the intestine, called the pylorus. This pylorus opens at intervals and permits a portion of the food to pass out. In the walls of the stomach are numerous small glands which pour out the gastric juice containing weak hydrochloric acid and pepsin. This secretion begins the digestion of protein foods.

(*e*) The small intestine, a coiled tube, twenty to twenty-four feet long in a grown person. The food takes ten to twenty hours to pass through this part of the alimentary canal, being constantly churned up and periodically squeezed forward down the intestine by the action of the muscles in its walls. In the small intestine three important digestive juices are added, the pancreatic juice and the bile, from large glands called the pancreas and the liver, respectively, and the intestinal juice from small glands in the wall of the intestine itself. The bile supplies enzymes which digest fats and also assists in excretion, since it contains certain important waste materials of the body. The pancreatic juice is the most important of all the digestive fluids, acting on all sorts of food materials; and

the greater part of the digestive process takes place in the small intestine, not in the stomach. It is in the small intestine, too, that most of the actual absorption of digested foods into the body takes place. The surface of the small intestine is increased by being raised up in the form of millions of little finger-like projections, called villi, richly supplied with blood vessels. Through the walls of these villi the digested food materials pass from the intestinal canal into the blood.

(*f*) The large intestine, which passes from its junction with the small intestine, first upward on the right side of the body nearly to the level of the stomach, then across to the left side, and then downward to its opening. Near the beginning of the large intestine, on the lower right-hand side of the body, there branches off a small sac called the vermiform appendix. Inflammation of this sac causes appendicitis. Since most of the food elements have already been absorbed in the small intestine, little remains to be done to the food mass in the large intestine except to absorb water from it, press it together, and store it, ready for discharge in the form of feces.

**The Chemistry of Digestion.**—Aside from the general structure of the alimentary canal, the most important point to be emphasized is the fact that the human body operates as a chemical laboratory, as well as a physical machine. The change of starch to sugar under the action of the saliva can be demonstrated by chewing bread or potato slowly and thoroughly. One is conscious of a sweetish taste. The action of the gastric juice can be easily shown by an experiment described on page 249. Such changes as these are

brought about by the action of very peculiar and interesting chemical substances, called enzymes, present in the saliva, gastric juice, and other digestive juices. Enzymes cannot be produced in the chemical laboratory and are not found in nature except as they are formed by living cells. In all living processes, however, they play a very important rôle within the cells themselves as well as in the secretions of the body. The particular property of enzymes is that they have the power of setting up certain chemical changes (such as the change from starch to sugar) without being used up in the process. They are in a sense stimulators or accelerators of such changes as those which go on in digestion. Since they are not themselves consumed, very small amounts of enzymes will cause extensive chemical reactions.

**Hygiene of the Digestive System.**—Such a view of the general working of the digestive system as has been just outlined forms the best basis for an intelligent understanding of the importance of good alimentary habits. The stomach, for example, is designed to work on a semi-liquid pulp, not on large masses of food. Slow eating and thorough chewing are therefore clearly indicated. It may be pointed out that getting the full flavor of food by slow eating, instead of bolting, stimulates the flow of the digestive juices through reflex action.

The digestive system should not be overloaded by overeating at one meal. A light fourth meal, such as a glass of milk and some crackers, is good for the younger children in the middle of the morning. However, nibbling between meals is a bad habit because it

keeps the digestive system at work all the time and, because the food eaten, such as candy, is likely to take the place of more valuable foods served at meal-times. From four to six glasses of water a day should be drunk; but too much water at meals, particularly if it is cold, is harmful. Foods which are difficult of digestion, such as pickles, olives, pie, heavy cake, fried foods, unripe fruit, should be avoided or eaten only in moderation. Violent exercise or bathing after meals draws the blood away from the digestive system where it is needed at this time. Mental excitement may interfere with digestion for similar reasons. Therefore, quiet and calmness at meal times are important factors in digestive hygiene.

**The Structure of the Teeth.**—The teeth form an essential part of the digestive system, and their care should be emphasized in even the most elementary course in hygiene. The twenty teeth of the first, or temporary, set appear during the first two years of life and are gradually replaced by the thirty-two permanent teeth, from the age of six until the " wisdom teeth " finally appear sometime between seventeen and twenty-five years. The earliest of the permanent teeth, the six-year molar, is of special importance in its influence on the development of the entire set. It is often confused with the temporary teeth, but can always be identified as the sixth tooth in the jaw by counting back from the middle of the front, there being only five teeth on each side in the temporary set. The child may be interested in the general question of the form and arrangement of the teeth by comparative discussion of the grinding teeth of herbivorous animals

and the sharp tearing teeth of carnivora. Our own permanent teeth, adapted to a mixed diet, include in each jaw: in front, four sharp cutting teeth or incisors; at the sides, two cuspids and four bicuspids, suitable both for cutting and grinding; and, still further back in the jaw, six flat grinding molars.

The structure of the tooth is also important for a proper understanding of dental hygiene. The crown of the tooth, the part which appears above the gum, is covered with hard, shining enamel. The root below is covered with cement. The molars have their roots divided into two or three separate prongs, or fangs. Inside the enamel and cement is a bony substance called dentine which makes up the main body of the tooth and inside the dentine is a soft mass of pulp containing blood vessels and nerves.

**The Hygiene of the Teeth.**—The two principal diseases to which the teeth are subject are dental caries, bacterial decay of the enamel and dentine, forming cavities; and pyorrhea, a bacterial infection of the edges of the gums. Pyorrhea may cause the teeth to loosen and fall out; but the effects of dental caries are even more serious. If the cavities produced by dental decay are not attended to, they become deeper and deeper and finally reach the living tissues of the pulp. Abscesses may be formed below the teeth, and from these abscesses bacteria or their poisons may pass to other parts of the body causing very serious conditions, such as rheumatism or heart disease.

There are three general lines of defense against dental disease. The first is good general dietary hygiene. The conviction is growing among students

of this subject that tooth decay is largely the result of faulty diets in infancy and childhood. The drinking of plenty of milk and the eating of plenty of green vegetables by children will prevent much suffering in later life.

A second aid in keeping the teeth in good condition is of course the tooth brush. Regular brushing twice a day with a good powder or tooth paste should be urged as an essential in the hygienic round of the day. The younger children should be trained to hold the brush properly and to give it the rotary motion which is most effective. In the toilet of the teeth, the subsequent thorough rinsing of the mouth is an element of fundamental importance.

The third and final defense against dental decay is the regular dental examination of the teeth, preferably twice a year, for the detection and correction of diseased conditions in their earliest stages. It is difficult to overemphasize the importance of this precaution and its value in saving expense, suffering, and danger to general health. It will be well, too, to point out the value of expert dental service in the straightening of teeth which have developed irregularly and the contribution which the dentist can thus make to both health and beauty.

### Topics for Investigation and Discussion

1. The value of height-weight ratios in detecting under-nourishment.
2. Balanced diets and how they are made.
3. The relation of dental hygiene to health and disease.
4. The physical aids to digestion.
5. The psychologic aids to digestion.
6. The importance of milk in the child's diet.

Respiration!

# CHAPTER VIII

## THE BODY AS A THERMAL MACHINE

**The Body as a Combustion Engine.**—The idea that the body acts as a combustion engine is fundamental to a sound conception of the vital process. The food supplies the oxidizable material or fuel. The lungs furnish the oxygen. The result of the oxidation which takes place within the cells is the performance of work and the liberation of heat; and the process results in the formation of oxidized or partially oxidized waste products, such as carbon dioxide, which tend to act as poisons to the body unless they are promptly removed.

We have already considered the problem of fuel for the body machine. In the present chapter the questions of oxygen supply and of the thermal phenomena which result from tissue oxidation will be discussed, so far as they are important in their bearing on the child's conception of the living machine and particularly in relation to good breathing habits, physical exercise, and the problem of ventilation.

**The Organs of Respiration.**—In normal breathing the air should be drawn in through the nose (not the mouth) into the pharynx at the back of the throat. The pharynx really represents a short common section of both the alimentary and respiratory systems. Above, air enters it from the nasal passages and food

from the mouth. Below, food passes out of it down the esophagus and air passes out by way of the larynx into the trachea or windpipe. The opening from the throat to the larynx is shut off when necessary by a little door, the epiglottis (see Fig. 10, p. 117).

The trachea lies just in front of the esophagus. Its upper part is the larynx, or voice box, where many of the sounds of speech are made by the vibration of the two vocal chords. At its lower end the trachea subdivides into the two bronchi, which open in turn into the lungs. Within each lung the bronchus subdivides again and again, like the branches of a tree, each branch finally ending in an air sac or alveolus. There are about 725,000,000 of these tiny air sacs. If their surfaces could all be spread out side by side they would cover an area of over 2000 square feet. When we draw a deep breath, each one of these alveoli swells up and becomes filled with relatively fresh air, and through its thin walls oxygen from the air passes into the blood, while carbon dioxid passes out from the blood to the air in the lung. As a result of this interchange the air which is exhaled contains 16 per cent oxygen and 4 per cent carbon dioxid as compared with 21 per cent of oxygen and .03 per cent carbon dioxid contained in the air inhaled.

The mechanical movements necessary to keep up a supply of fresh air to the lungs take place about twenty times a minute. They are effected in two distinct ways: by the action of the muscles of the ribs and by the action of the diaphragm, a dome-shaped muscle which separates the thoracic cavity from the abdominal cavity, forming a floor to the former and a roof to the

latter (see Fig. 2, p. 38). In the act of inspiration the rib muscles contract so as to raise the ribs and increase the volume of the thoracic cavity forward and upward, while the diaphragm contracts so as to lower the floor of the cavity and thus increase its volume downwards. As the thoracic cavity as a whole is expanded, the elastic walls of the lungs expand in a corresponding fashion and draw air into the alveoli. In expiration, as the muscles relax, the ribs fall back into place, the diaphragm rises, and the whole process is reversed.

The complex machinery of respiration is governed by a certain small group of nerve cells in the lower part of the brain. The action of these nerve cells is controlled by the amount of carbon dioxid in the circulating blood. When one exercises vigorously, an excessive amount of carbon dioxid is produced in the muscles; the carbon dioxid in the blood increases; and, as a result, the nerve cells of the respiratory center are stimulated to produce more rapid and deeper breathing. Exercise trains this complex machinery to operate more smoothly and effectively, so that a person "in good training," as we say, does not have to puff and pant and feel "out of breath" in running for a car or climbing a flight of stairs.

**The Organs of Circulation.**—The food materials absorbed by the intestinal wall and the oxygen taken in from the alveoli must, of course, be carried in some way to the individual cells in all parts of the body where the actual vital oxidation is to take place, and the waste products from this oxidation must be carried from the cells to the various organs of excretion. This

is the function of the circulation, the transportation system of the body. This system may be likened to the streets of a city, the cells representing the individual houses (see Fig. 6).

The blood itself is a pale straw-colored fluid called the plasma, containing great numbers of red corpuscles floating in it. These red corpuscles are living cells containing a substance called hemoglobin, which has the power of temporarily uniting with oxygen and does most of the work of carrying oxygen to the tissues. In the course of twenty-four hours about eighteen cubic feet of oxygen are transported about the body by these blood cells. There are also present in the blood a much smaller number of white blood corpuscles and still smaller bodies, called platelets. The white corpuscles are scavenger

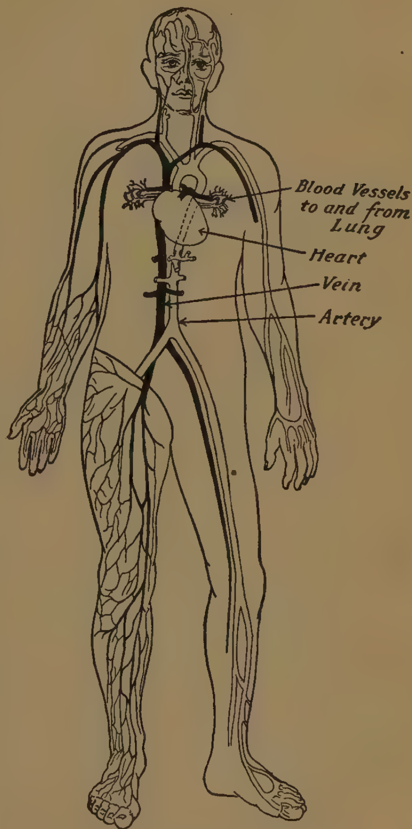


Fig. 6.—The circulatory system.

cells, helping to free the blood from foreign materials, such as invading bacteria. The chemical composition of the liquid part of the blood and the number of cells of various kinds are very constant in health. The chemical or microscopic examination of the blood

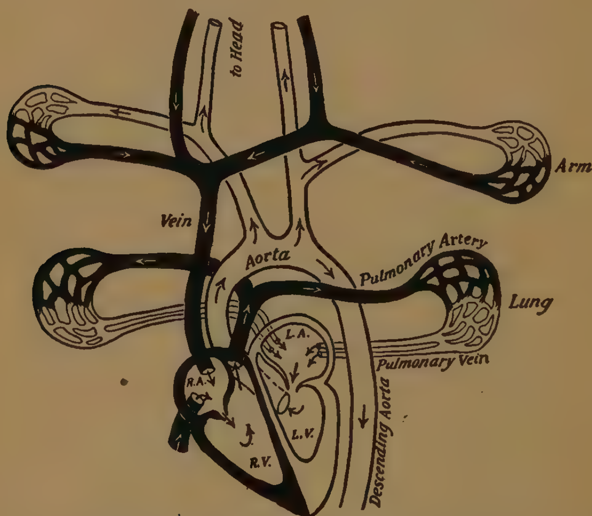


FIG. 7.—The heart and some of its chief blood vessels. Blood containing oxygen indicated in white; blood poor in oxygen, in black. R. V. right ventricle, R. A. right auricle, L. V. left ventricle, L. A. left auricle.

is, therefore, of great value in detecting conditions of disease.

The heart, which forms the central motive power of the circulatory system, is a hollow mass of muscle about the size of the owner's fist, possessing the remarkable property of rhythmic contraction. It contains four distinct chambers, a right and left auricle above, and a right and left ventricle below. The

general course of the blood stream is as follows (see Fig. 7):

(*a*) From the left ventricle through a very large artery, the aorta, to the other arteries which branch repeatedly until they reach the ultimate tissues of the body. The left side of the heart is therefore the pump for the general circulation of the blood through the body as a whole.

(*b*) Through the capillaries, the finest of all the blood vessels, from which food materials and oxygen pass outward to the tissues, while waste products pass from tissues to blood. In the capillaries of the intestinal wall food materials are absorbed and in the capillaries of the excretory organs waste products are given up. The total cross section of the capillaries is very much greater than that of the large arteries, so that the blood flows much more slowly through them than through the vessels near the heart. This allows ample time for these important changes to take place.

(*c*) From the capillaries to the small veins which gradually unite into larger and larger veins.

(*d*) From the large veins to the right auricle and thence to the right ventricle.

(*e*) From the right ventricle by the pulmonary arteries to the lungs. The right side of the heart which has only to pump the blood through the lungs is smaller and less developed than the left side.

(*f*) From the lungs by the pulmonary veins to the left auricle and thence to the left ventricle.

Arteries are vessels carrying blood from the heart; veins are vessels bringing blood to the heart. In the arteries—except the pulmonary artery—the blood is

laden with oxygen; in the veins—except the pulmonary vein—it is poor in oxygen and laden with carbon dioxid.

The driving force of the circulation is the rhythmic contraction of the heart. It is the transmitted wave of this beat that we measure when we feel the pulse and note that it recurs 60 or 70 or 80 times a minute. The rate of the heart, of course, varies markedly with physical exercise, increasing its activity to meet the needs created by muscular exertion. The reason why the heart beats more rapidly under the influence of excitement is perhaps because under conditions of primitive life the facing of danger involved sudden and violent physical effort. The direction of the blood flow is controlled by flaps, or valves, in the heart and the veins. Thus, there are valves between the auricles and the ventricles which open only downwards so that when the heart expands they open and allow the blood to flow from auricle to ventricle. When the heart contracts, they close again so that the blood is forced out into the arteries, not back into the auricle again. Similar valves in the veins allow the blood to flow toward the heart, but not in the opposite direction.

The heart, like any other organ, develops greater efficiency with use; but to put an undue burden upon a heart not in good training or upon a heart that has some definite structural weakness may do the most serious damage. This is one of the reasons why it is so important that the children should be given a thorough physical examination before they are permitted to engage in taxing athletic competitions.

The blood vessels themselves are not inert conduits. Their walls are lined with tiny muscles which exert constant pressure on the blood, forcing it forward. The degree of force exerted by these muscular walls of the blood vessels determines the amount of blood which flows through a particular organ. When we exercise the muscles, their cells need more oxygen and give off more carbon dioxid; the blood vessels in these muscles expand and more blood flows through the tissues to meet the local need. After a meal a specially large supply of blood is needed by the digestive organs. This is why exercise or bathing just after eating is so harmful.

The heart, arteries, capillaries, and veins form what is practically a closed system of tubes; but beyond this system there is another fluid, the lymph, which bathes the cells of the various tissues. It is lymph which oozes out from a scratch too superficial to draw blood and which gathers in a blister. The lymph is essentially the liquid portion of blood, without the red blood cells ~~but rich in white~~ blood cells. It absorbs oxygen and food materials from the capillaries and gives them up to the tissue cells, with which it therefore makes the final effective contact. The lymph is in slow but constant motion. In the tissues new lymph is constantly being formed by diffusion outward from the blood. The excess of lymph from the various organs is collected by a special system of tubes, the lymphatics, which unite into larger and larger lymphatics and finally empty into the large veins.

**Hygiene of the Heart and Lungs.**—A knowledge of the structure and working of the lungs emphasizes

anew the importance of correct standing and sitting posture. When a person slouches in walking, bends over a desk all day, or wears tight clothing that binds the ribs and the diaphragm, the chest cannot expand properly. Breathing is restricted, air is not drawn into the deeper parts of the lungs, and the neglected alveoli tend to degenerate and become diseased. Slow, deep breathing is an important health habit. Breathing should always be through the nose, since the nasal passages are specially designed to warm and moisten the incoming air and strain out its impurities. If mouth breathing cannot be corrected by a little thought and effort, there is probably some condition present which demands medical care.

The general health of the heart and lungs depends also, as has been pointed out in earlier chapters, upon general habits of physical exercise. Whatever develops the muscles, develops the heart and lungs as well. A sedentary life inevitably means lack of good health tone on the part of these essential organs. The sound working of the peripheral blood vessels may also be promoted by factors involved in the physiology of the skin, a subject which demands preliminary consideration of certain of the general thermal relations of the body machine.

**Heat Regulation in the Body.**—Oxidation is a process which always produces heat. The food burned in the body, containing, let us say, 3000 calories of potential heat energy, liberates a corresponding number of calories of heat energy when it is burned in the tissues. When physiologists place human subjects in specially insulated experimental chambers and

measure and analyze the food they eat, the oxygen they consume, the carbon dioxid they give off, and the heat they produce, the correspondence with the laws of ordinary chemical combustion is found to be an exact one. It is to this combustion within the tissues that the body owes its "animal heat."

The remarkable thing about this whole phenomenon is that, however much heat production within the tissues is increased or decreased by exercise or inaction, and however much heat loss from the body surface is increased or decreased by low or high atmospheric temperatures, the healthy body, inside those limits within which normal life is possible, maintains an almost constant temperature of 98.6° F. This means an exact balance between heat production in the body and heat loss from its surfaces. It is in general the factor of heat loss which is varied to bring about this regulation.

In certain diseases, particularly those due to infection with microbes, the body temperature rises above normal, or, as we say, a condition of fever sets in. Every household should be provided with a clinical thermometer, and if symptoms of illness of any kind appear the temperature should be taken. A temperature over 99.5° is an indication that something is wrong and that medical care is desirable. In this way an infectious disease may often be detected and given proper care much sooner than would otherwise be the case.

Heat loss from the body surface takes place in two general ways, by direct radiation and conduction on the one hand, and by evaporation on the other. When

the outside temperature is low the small blood vessels in the skin contract and permit less blood to flow through the skin, so that a smaller volume of blood is exposed to the cooling influence of the air. When the air temperature is high, on the other hand, the skin blood vessels expand and bring a larger proportion of the blood to the surface to be cooled. This is why the cheeks become flushed in a hot room. At the same time the sweat glands begin to secrete perspiration whose evaporation produces an additional cooling influence.

The effect of a given atmosphere upon the body depends not only on the temperature of the air but also on its humidity and the extent to which it is in motion. Very high humidity is always undesirable. Moisture in the air makes cool air feel cooler, because at low temperatures the body loses heat chiefly by conduction, and moist clothing conducts heat away very fast. At high temperatures, on the other hand, evaporation is the most important factor in heat loss. Hence a humid atmosphere makes hot air feel hotter because the moisture in the air interferes with evaporation from the body surface. As to the effects of very dry air, such as we find in the ordinary schoolroom in winter, we really have very little exact knowledge, in spite of the dogmatic statements often made in regard to the matter.

**The Hygiene of the Skin.**—The development of a healthy activity on the part of the smaller blood vessels of the skin is one of the most important, and one of the most neglected, of all phases of personal hygiene. Everyone is familiar with the danger that

comes from exposure to severe cold, and undue chilling of the body may indeed so lower vital resistance as to lead to the active development of latent respiratory infection. This danger is, however, generally over-emphasized. It is not commonly realized that exposure to even slight degrees of overheating has also very definitely harmful results.

Recent researches have shown that even a slight excess of room temperature above 68° F. begins to produce far-reaching and generally harmful physiological effects. The body temperature itself rises slightly, the pulse increases, the blood pressure and the general tone of the blood vessels decrease. We feel dull and listless, and our efficiency is markedly reduced. The studies of the New York State Commission on Ventilation showed that 15 per cent less physical work was performed at 75° F. than at 68° and 37 per cent less at 86° than at 68°. Finally, susceptibility to respiratory infection is greatly increased by the habit of living in overheated rooms. The New York investigation showed that in a group of schoolrooms at an average temperature of 68.5° there was 18 per cent more absence due to respiratory illness and 70 per cent more respiratory illness among pupils in attendance than in a similar group of schoolrooms kept at an average of 66.5°.

It is, therefore, of very real importance to keep the blood vessels of the skin in good condition. This involves, of course, protection from extreme cold, but also protection from the debilitating effects of even moderate overheating. The health of the cutaneous circulation is markedly favored by the stimulating

effect of moderate changes in atmospheric temperature and air movement. There are three distinct ways in which skin hygiene can be promoted: by maintaining a cool but varying air temperature; by wearing clothing that is not too heavy; and by cold bathing. Cold baths furnish one of the most valuable methods of training the blood vessels so that they will respond quickly and readily to environmental temperature variations.

**Modern Conceptions of Ventilation.**—Twenty years ago it was generally held that the discomfort and injury to health experienced in badly ventilated rooms was due to the presence of subtle organic poisons given off in the breath. Some people even believed that the trouble was due to lack of oxygen or to the toxic effect of carbon dioxid. These views have now been shown to be fallacious. Under any ordinary conditions the air of the worst ventilated room contains ample oxygen and shows a practically insignificant increase in carbon dioxid. Nor is there any evidence whatever that chemical poisons are present as a result of human occupancy. The air of a crowded room even at a low temperature does, however, contain organic matter from mouths, clothes, and bodies. This gives it a stale smell, which may exert a subconscious effect upon physical activity and upon appetite. This influence is relatively slight, however, as compared with the effects of overheating, and it can be avoided by much less extensive air change than was considered necessary on the old theory of carbon dioxid poisoning, or that of body toxins. The state laws requiring the installation of mechanical ventilating systems, which will supply

thirty cubic feet of air per minute for every child in the schoolroom, were drafted under the earlier conception. The amount of air change called for by such laws is not only needless and expensive but definitely harmful to health, since an unduly large air flow must necessarily be compensated for by overheating.

In many industrial processes poisonous fumes or dusts may be present in the air and may do serious damage. In other industries there is a hazard created by the presence of quartz dust. This dust, when inhaled, has a marked predisposing effect toward tuberculosis, as is noted among grinders and polishers and granite cutters. In all such cases the worker should be protected by removing the fumes or dusts by means of special exhaust ventilation.

In the ordinary schoolroom, on the other hand, the problem is to keep the air reasonably fresh but, above all, cool and in moderate, but not excessive, movement. A thermometer in good working order and preferably with a prominent red line at 68° F. should form an essential part of the equipment of every schoolroom. It should be the task of someone to keep an eye upon it at frequent intervals and to see that the 68° point is not more than slightly passed.

The main object of ventilation is to maintain a supply of cool air and to remove the air that has been overheated by the bodies of the occupants. It is difficult to attain this end in cold weather by the use of ordinary windows alone without producing drafts. On the other hand, the New York State Commission on Ventilation found that ideal conditions could be maintained by drawing fresh air through windows,

specially equipped with slanting window boards to deflect the air current upwards and with radiators below the windows to temper it, and by permitting the vitiated warm air to escape from the upper part of the inside wall through a gravity exhaust duct. Where for any special reason it is impossible to keep windows open, mechanical or fan ventilation may be used. Fans are essential in the ventilation of auditoriums and of many crowded factory workrooms.

### Topics for Investigation and Discussion

1. The relation of exercise to the complex machinery of respiration.
2. The reasons for giving children thorough physical examinations before permitting them to engage in competitive athletics.
3. The significance of the balance between heat production in the body and heat loss from its surfaces.
4. Atmospheric factors which influence heat loss and methods of control and effects.
5. Modern methods of good ventilation.

# CHAPTER IX

## ALCOHOL AND OTHER POISONS

**Waste Products of the Life Process.**—The health of the body depends, first of all, on the fulfillment of certain positive conditions, on adequate food supply, for example, on oxygen, on proper air temperature. It also demands, on the negative side, freedom from definitely harmful influences, such as poisons which interfere with the normal activities of the living cells. First and foremost among the poisons which may hamper the normal vital process are the waste products formed in that process itself. These waste products, constantly produced by the chemical changes which go on in protoplasm, must be carried away from the tissues. One of the chief values of exercise lies in the fact that it stimulates the flow of blood and lymph and, as it were, flushes out and cleans the tissues from such toxic accumulations. An excess of waste products in the blood stream itself would of course be as harmful as in the tissues. Hence the active functioning of the organs of excretion, which finally eliminate such products from the body, is a primary essential of healthy living.

The principal organs of excretion are the lungs, the skin, the liver, and the kidneys. Carbon dioxid is the waste product given off in the lungs. The sweat, dis-

charged from the two or three million sweat glands in the skin, not only serves to cool the body but also carries with it an appreciable amount of nitrogenous waste products. The presence of these products largely accounts for the "body odor," and the necessity for their removal is one of the chief reasons for frequent bathing.

The bile, formed in the liver and discharged into the small intestine by way of the bile duct and the gall bladder, contains, as we have seen, a digestive juice which aids in the digestion of fats; but it also serves as a vehicle for the excretion of wastes.

The kidneys, on the other hand, are organs devoted solely to excretion. They are bean-shaped bodies lying in the back, each measuring about four inches by one and a half inches in an adult. They contain a rich network of blood vessels from which water and salts and nitrogenous waste products are filtered out to form the urine, which passes from the kidneys to the urinary bladder where it is stored for discharge. The bladder should be emptied about six times a day. In order to keep the kidneys working freely it is important to drink plenty of water and eat watery foods, such as fruits and green vegetables.

**Elimination of Intestinal Wastes.**—The materials present in the lower part of the intestinal tract are—except for the bile—not excretions from the body but merely excess or indigestible food wastes. If the diet, and particularly the protein part of the diet, is very exactly adjusted to the needs of the body these wastes will be largely made up of stable and indigestible substances, like cellulose, and will be light-colored and

inoffensive. If, however, as is usually the case, the intestine contains a considerable proportion of unabsorbed protein material, the decomposition of nitrogenous substances by the putrefactive bacteria present leads to the formation of toxic products which may be absorbed and cause headaches and a generally dull and miserable feeling. The authors are inclined to believe that the influences of such auto-intoxications, as they are called, are very far-reaching and that their avoidance is a most important factor in personal hygiene.

The control of intestinal putrefaction depends first on moderation in the use of protein foods and second on the observance of various hygienic practices, which induce a regular evacuation of the bowels at least once daily. Among the best methods of avoiding constipation are: the drinking of a glass of water on rising; a breakfast of fruit, oatmeal, and other foods containing stable indigestible material or roughage, which stimulates the peristaltic action of the intestines; vigorous exercise and plenty of fresh air, which produce a similar effect. The use of laxatives and cathartics as a regular routine is most undesirable and should be wholly unnecessary.

**Poisons in the Factory and the Home.**—Aside from these poisons of internal origin, health may be injured and life destroyed by chemical poisons generated in various industrial activities or in the processes of combustion. Thus painters and paint makers, storage battery workers, potters, and men in many other trades where lead compounds are used suffer from lead poisoning. Other metallic salts such as those of mercury and arsenic, organic compounds like aniline and

benzol, strong acids and alkalies, oxides of nitrogen used in making explosives, and various other chemical substances exert a characteristic toxic or irritant action.

Among the most common and most serious of these poisons is carbon monoxid gas. This substance is produced wherever imperfect combustion is going on and, unlike carbon dioxid, it is highly poisonous. Every year a great many deaths occur from this cause, not only in industrial plants—blast furnaces and the like—but in garages where this gas is formed in dangerous concentration by leaving the engine running in a confined space, and in our houses, where it is liberated by defective gas piping or by the action of badly constructed gas heaters.

**Alcohol as a Race Poison.**—In view of the fact that prohibition is the law of the land, it might at first thought seem unnecessary to devote much attention to this particular problem. It is indeed true that the duty of the citizen to obey existing laws is not open to debate. The success of law enforcement depends, however, in large measure upon educated public opinion. In current arguments about the wisdom of existing legislation and the practical results which have followed from it, we must not lose sight of the fundamental biological facts which are involved. These facts are that alcohol is a drag upon national efficiency and a menace to national health, and they are facts which still require clear emphasis in any course on physiology and hygiene.

It should be pointed out, first of all, that alcohol is not a stimulant but a narcotic and that its action is to

inhibit and slow down the exercise of the various functions of the body. Physiologists, for example, who have studied the effect of even moderate doses of alcohol upon muscular work, as measured under laboratory conditions by the use of the ergograph, report a very definite decrease in efficiency as a result. Soldiers on forced marches, athletes in training for athletic teams, are never allowed to use alcohol on account of its proved interference with a maximum of physical achievement.

Similarly, Benedict at the Carnegie Nutrition Laboratory and many other physiologists and psychologists have shown that reflex actions and various other forms of mental activity are definitely limited by even slight amounts of alcohol. Just as experience in the army and on the athletic field confirms laboratory conclusions in regard to the effect of alcohol upon physical attainment, so are the laboratory tests on mental work confirmed by the experience of industry. Long before the time of national prohibition, employers of labor had arrived at the conclusion that the use of alcohol contributed so much to the causation of industrial accidents and so hampered the keenness and efficiency upon which modern industry and commerce depend, that they would not knowingly employ habitual drinkers for any important service.

The harmful effect of alcohol upon health is as clear as its influence in decreasing efficiency. In considerable amounts it exerts very direct damage to the digestive organs, the liver, the kidneys, and the blood vessels, favoring the development of such disorders as Bright's disease and hardening of the arteries. Its habitual use predisposes the user in marked degree to communicable

diseases, such as tuberculosis and pneumonia, and makes recovery from such diseases difficult and doubtful. Insurance statistics indicate that even the use of alcohol in relatively small amounts is associated with a definitely excessive death rate as compared with that which obtains among abstainers. The New York City Health Department in a bulletin issued before the days of prohibition made the statement that "The discontinuance of the use of alcohol will mark a greater advance in public health protection than anything since application of our knowledge of the bacterial origin of disease." The New York State Department of Health placed on one of its educational charts the following sentence, "Alcohol causes more misery, sickness, inefficiency, and death than any other single cause." These are the basic and inalterable facts which should determine the attitude of the American people toward the use of alcoholic beverages.

**Habit-forming Drugs and Patent Medicines.**—Another very serious problem of race hygiene is that which arises from the use of habit-forming drugs, such as opium and its derivatives. In general we should make clear to children the sharp distinction between foods, which contribute to the ordinary normal chemical processes of the body, and drugs, which are used to alter those processes in certain definite ways, when they are proceeding abnormally. Thus drugs may be used to dull pain, to promote sleep, to stimulate appetite, to influence the heart rate; but they should be used only on the advice and under the direction of a physician, since only a physician knows how and when they can be safely taken. The purchase of patent

medicines and in general the habit of self-medication is therefore exceedingly dangerous, in itself. Moreover, the chance of recovery is often lost by people who delay seeking medical advice until too late, while they are wasting time and money on useless nostrums.

Above all, it is important to remember that drugs of the opium type have the peculiar and deadly characteristic of leading to a gradually increasing dependence upon the drug in question. The unhappy victim of the drug habit is really physically ill when deprived of the poison, whose continued use will only drag him deeper and deeper into its toils.

**Tobacco, Tea and Coffee.**—The use of tobacco is of course much less harmful than that of alcohol or drugs. Excessive smoking, however, injures the delicate membrane of the upper respiratory tract, causing a cough and "smoker's sore throat"; injures the heart, causing what is called "shortness of breath,"—really due to defective heart action; affects the digestion; and causes unsteadiness of eye and hand. Young people are particularly susceptible to these influences. Hence, one should never smoke at all until the age of full physical development. Statistics have been collected at various schools and colleges which indicate that boys who smoke, as a group, show distinctly poorer physical development and lower class standing than non-smokers. These effects cannot, of course, be wholly attributed to the influence of tobacco. Strong, healthy, normal boys are much less likely to indulge in smoking than those who are mentally or physically below par and who have other bad habits as well. Nevertheless the effect of tobacco upon nerves and

heart is so well known that the use of tobacco is forbidden to athletes in training. This fact is a sufficient argument against smoking for the boy or girl who wants to be at his best physically and mentally.

The situation with regard to tea and coffee is somewhat similar. They contain stimulants which in moderation are generally harmless for older people; but boys and girls are in no need of artificial stimulants of any kind. The circulation and the nervous system of the growing child may be seriously injured by the use of these substances, which are drugs rather than normal foods.

### Topics for Investigation and Discussion

1. Fatigue as toxic poisoning.
2. The economic results of occupational diseases.
3. Governmental regulation in industries producing occupational diseases.
4. The biological arguments for prohibition.
5. The dangers and abuses of patent medicines.
6. The Harrison Anti-narcotic Law and its aims.
7. The effect of tobacco on the human organism.
8. Tea and coffee: foods or stimulants.

# CHAPTER X

## THE COÖRDINATING MACHINERY OF THE BODY

**Structure of the Nervous System.**—After a general survey of those systems of the body which function in movement, in digestion, in respiration, in heat regulation, and in excretion, it is necessary to round out the conception of the living machine by consideration of the system which coördinates all its varied activities with each other and modifies them from moment to moment to meet changing conditions in the world outside. This internal coördination and external adjustment is primarily the task of the nervous system and the sense organs.

The nervous system is composed of: (1) the brain, with its three parts, the forebrain or cerebrum, the hind brain or cerebellum, and the region below the cerebellum called the medulla; (2) the spinal cord which passes down through the center of the backbone; (3) the nerves running out from the brain and cord with their ganglia; and (4) a partially distinct set of nerves and ganglia making up the "sympathetic system."

The fundamental function of the nervous system is as follows: It brings to central points impulses corresponding to stimuli received by the sense organs in various parts of the body; it coördinates these impulses

or messages and sends out appropriate stimuli to cause the actions necessary in adjusting the behavior of the various organs to conditions which have arisen.

The mechanical nature of the action of the nervous system may be made clear by emphasizing the way in which particular types of response are localized in particular areas of the central nervous system. In general, the cortex of the right side of the brain controls the muscles of the left side of the body and vice versa. The large forebrain, or cerebrum, is the center of conscious perceptions for the conduct of voluntary actions and for thinking and reasoning. Certain small areas of the cerebrum have been shown to be the seats of particular mental processes. Thus an injury in a certain region may affect speech; in another, vision; in another, the power to make certain voluntary movements. The hindbrain, or cerebellum, and the region between the cerebellum and the cord, called the medulla, are chiefly concerned with involuntary actions such as breathing and walking.

The fundamental elements of which the nervous system is built up are the nerve cells, with long thread-like processes running out from them called the nerve fibers. The nerve cells themselves are located in swellings on the course of the large nerve trunks adjacent to the cord, called ganglia, or in the outer layers (gray matter), or cortex, of the brain, or in the inner part of the spinal cord itself. Here they come into contact with each other by means of fine spider-like processes, the whole of the gray matter forming a sort of intercommunicating network something like the switchboard in a telephone exchange. The inner part

of the brain and the outer layers of the cord are largely made up of the slender glistening nerve fibers (white matter), which form the principal processes of the nerve cells. The reason why the white matter of the brain is chiefly in its interior is that most of the nerve fibers from the brain pass down into the cord.

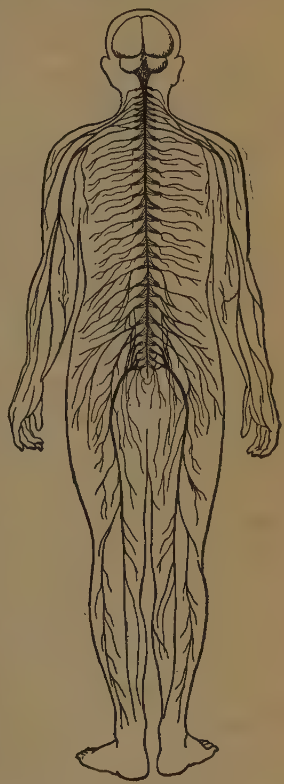

FIG. 8.—The nervous system.

Large masses of nerve fibers pass out, however, from the white matter of the brain to nose and eyes and ears, while the cord gives off a pair of nerve trunks at each vertebra. These nerve trunks continue to branch as they pass to the remoter regions of the body until each individual fiber in the bundle reaches its ultimate destination (see Fig. 8). At their outer ends the nerve fibers break up into fine branches making electrical connection with other nerve cells or muscle cells, or gland cells, or sense organs. In general, the nerve fibers are of two distinct kinds, sensory fibers and motor fibers. The sensory fibers bring in to the central nervous system messages from the peripheral sense organs. The motor fibers carry out the messages which cause action on the part of the muscles or other organs.

These "messages" transmitted along the nerves are of the nature of electrical charges.

Many of the automatic processes which go on within the body, such as the heart beat, the movements of the digestive organs, and the heat-regulating machinery of the skin are in part controlled by a special group of ganglia and nerve fibers, lying in two chains on each side of the backbone but connected with the spinal cord by nerve fibers. This is called the sympathetic system, because it keeps the various organs working together in sympathy with each other.

**Reflexes and Inhibitions.**—There are two conceptions in regard to the working of the coördinative machinery of the body which are fundamental to a basic conception of the hygiene of this organ-system. The first of these is the idea of a reflex action, such as occurs when we automatically withdraw the hand from a hot surface. In such an action there must have been, first of all, an effect of heat upon the sense organs of the skin; second, the transmission of a sensory impulse to the central nervous system; third, a connection in the gray matter which somehow transforms perception into action; and fourth, the outgoing of a motor impulse to cause the contraction of those muscles which will produce the indicated movement.

Such a reflex action, as Howell has said, "is just like a definite electrical connection made through a switchboard, where if you throw the right switch you will always get the same result." Many reflexes are born in us and are entirely automatic in nature. Others, like the delicate reflexes which make it possible to keep the body balanced in such exercises as skating

or riding a bicycle, must at first be learned but later become automatic through habit. In a consideration of the value of such cultivated reflexes there is an excellent opportunity to emphasize the part played in daily life by habits, the ease with which our mental machinery works along lines which have been established, and the importance of forming good habits rather than bad habits as a basis for future conduct.

A second conception, which is of primary importance in understanding the working of the central nervous system, is the conception of inhibitions. A reflex action is not an independent inevitable process. It can be controlled and checked when necessary by another more powerful nerve impulse. Thus, if something hot is placed in the palm of your hand, there is a swift reflex response which tends to make you drop it. You can control this tendency, however, by the action of the will. When this occurs, a second nerve impulse of inhibition has overruled the first simple reflex. The cultivation of inhibition is just as essential as the development of reflexes.

**Exercise and Rest for the Nervous System.**—We have seen that the health and development of the muscles depend upon exercise and rest. Exactly the same thing is true of the nervous system. "Conduct," as Matthew Arnold said, "is three-fourths of life." The test of conduct, in the last analysis, is adaptation to one's environment, if we understand the term "environment" in a broad sense as signifying not merely the temporary circumstances of life but also the great underlying laws of the universe. By adapting ourselves to these underlying principles we acquire the

power to change and improve the superficial aspects of the immediate environment about us. We exercise the nervous system by training ourselves in conduct; by learning to see more and more clearly the facts and to understand more and more clearly the laws of nature; and by cultivating those responses or habitual actions which tend to happiness and progress for ourselves and others. Clear thinking is a habit, courage is a habit, unselfishness is a habit, happiness is a habit. All these virtues can be cultivated by practice, very much as the simple balancing reflexes are cultivated when one learns to ride a bicycle.

Rest, too, is quite as essential for the nervous system as for any of the other organs of the body. Hard work develops the brain just as it develops the muscles; but work under too great pressure, or too long continued, produces undue fatigue and tends toward mental breakdown. Above all, worry and anger are far more taxing than any amount of straight hard work.

Rest for the brain and nerves can be obtained in various ways. A change in occupation, bringing into play a new set of nerve cells, rests those which are worked hardest in the daily round. Physical exercise, reading, games, cross-word puzzles, social intercourse, and many other forms of activity deserve the name of recreation because they make it possible to *re-create* or build up again the nerve tissues which have been used up in the performance of the tasks of daily life.

Sleep, of course, is the one great restorer since in quiet sleep all the nerve cells, except those concerned with the fundamental automatic processes such as

respiration and circulation, are at rest. Individuals vary somewhat in the amount of sleep they need, but almost all adults require eight hours of sleep on the average. Children should have ten hours at least and babies from fifteen to twenty hours out of every twenty-four. It never pays to reduce the hours allotted to sleep below the necessary minimum except in a special emergency, for those who do so habitually will surely pay the penalty in diminished efficiency and poise.

**The Eye.**—The sense organs by which we discover what is going on in the world about us form an integral part of the nervous machinery of the body as a whole. An understanding of the way in which they work is an essential part of a knowledge of physiology and hygiene. Among the various sense organs, the eye is the most complex (Fig. 9). It is by no means a perfect instrument, however, requiring in many cases to be aided by the use of glasses. This is a need which the teacher should always bear in mind in watching the behavior of her pupils. The eye is essentially a little camera, with a lens in front which bends the rays of light so as to form on the back of the eye a small picture of the scene on which the eye is focused. The lens is not hard like glass, however. Its shape can be changed by tiny muscles and membranes so as to make it more or less convex and to form a clear picture. When the eye

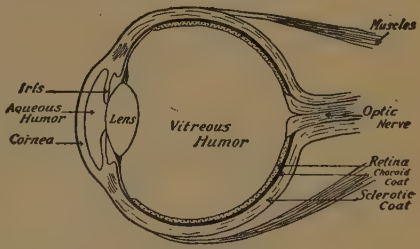


Fig. 9.—The structure of the eye.

focuses on an object which is far away the lens becomes less convex; when it focuses on an object near at hand tiny muscles contract so as to make it more convex. This process of adjustment is called accommodation. It takes an appreciable time, as you may note by gazing at a pencil a few inches from your eyes and then looking quickly to the other end of the room. For a second, while your eye is being focused, everything will look blurred.

At the back of the eye is the retina, which corresponds to the film of the camera. Here the light rays which make up the picture formed by the lens set up chemical changes. These in turn give rise to nerve messages, which are carried on into the brain through the optic nerve. It is these nerve messages which produce the sensation of sight.

The eyeball itself is made up of three coats, or layers. Outside is the sclerotic coat, a tough layer of tissue which encloses the whole eyeball except where the optic nerve enters at the back. It is white and opaque except at the front where it has a transparent window, the cornea. The cornea is so shaped that it acts as a lens and takes part, with the true lens of which we have spoken above, in forming the image on the retina. It is the part of the sclerotic coat around the cornea which we call the white of the eye. The next layer is the choroid coat, which is not continuous but has a circular opening in front opposite the cornea and another at the back for the passage of the optic nerve. It is the part of the choroid coat around the front opening, called the iris, which we see as a colored ring around the dark central opening, or pupil. It is there-

fore to the iris that we refer when we speak of a person as having blue or black or brown eyes. In a dark room the iris is drawn back so that the pupil is large and as much light as possible may enter the eye; while in a bright light the iris shuts in as if it were drawn by a puckering string so as to protect the eye against excessive glare. The third, inner, coat is the retina itself, which like the choroid does not continue over the front of the eye. In the retina the fibers of the optic nerve spread out and connect with the complicated structure sensitive to light. The space between the cornea and the lens is filled with a watery fluid, called the aqueous humor; while the eyeball itself contains a transparent jelly-like substance, the vitreous humor.

The eye is protected against injury by a bony ring around it and by the eyelids, folds of skin which close by a sudden reflex action at any motion which threatens danger. At the outer corner of each eye is the lachrymal gland, which pours out a liquid secretion to wash the eye and keep it clean. Ordinarily this liquid is formed only slowly and, passing across the eye, is carried away by a small channel into the back of the nose. Under the stress of emotion this secretion increases in amount and overflows in the form of tears.

It is important to avoid overstraining the eyes by using them too long at a time for reading or sewing or other fine work or by using them in a poor light. Too bright a light shining into the eyes may be just as harmful as a light that is too dim. Light for fine work should come from the left side and from above. A flickering, unsteady light is also harmful. This is the

reason why many people have headaches after using their eyes on a train.

**The Ears and Other Sense Organs.**—The organs of hearing are second only to those of sight in complexity and importance, although defects of hearing are less common among school children than defects of sight. The outer ear serves as a sort of horn for catching the sound waves and directing them into a tube, at the end of which is a thin membrane called the ear drum. The sound waves cause the ear drum to vibrate, and this motion is communicated to a chain of three little bones which stretch from the drum across the space behind, called the middle ear. From the chain of bones the vibration is communicated through the rear wall of the middle ear to the fluid in a third chamber, the inner ear, where the nerves of hearing end. From the middle ear there is an opening called the Eustachian tube, which connects directly with the back of the throat. It is by way of this tube that the middle ear sometimes becomes infected after a person has had a cold in the head.

The organs of taste are situated on the upper surface of the tongue and palate, the organs of smell in the upper part of the nose—near its connection with the back of the throat. The taste buds serve to distinguish sweet and salty things and sour and bitter things; but most of what we commonly call "tastes" are really perceived by the organs of smell, as one may realize by noting how completely they are lost when one holds the nose so that air does not pass freely up from the mouth. The organs by which we distinguish heat and cold, by which we feel the size and shape and surface of

objects, and by which we experience pain are true sense organs somewhat resembling those of taste and touch. They are distributed over the surface of the body but quite unequally in different regions. Thus, while the ends of the fingers are richly supplied with these sense organs, on the back and shoulders the sense of touch is so imperfect that if two blunt points an inch apart are placed on the back it is impossible to tell whether two points or one are in contact with the skin.

### Topics for Investigation and Discussion

1. Structure and function of the central nervous system.
2. Psychology and the central nervous system.
3. The effects of drugs on the nervous system.
4. The biological functions of the reflex.
5. Habit as education of the reflex and formation of inhibitions.
6. Fatigue and the nervous mechanism.
7. Defective eyesight and its effect upon the pupil.

# CHAPTER XI

## THE PHYSICAL DEFECTS OF SCHOOL CHILDREN AND THEIR CORRECTION

**Imperfections of the Human Machine.**—Our first impulse, as we consider the workings of the living machine, is to wonder at its complexity and effectiveness; and such a feeling of wonder is fully justified. The human body is indeed a marvelous mechanism, but it is by no means a perfect one. If it were, it would be a miracle and not a manifestation of the laws of nature. No man ever lived whose body was at all times and in all its organs in perfect health; and the majority of us fall very far short of that ideal of health expressed by William James when he said, "Simply to live, move, and breathe should be a delight."

The regular and systematic examinations of school children by physicians and nurses, which have been made with increasing frequency and care since the plan was first introduced in the United States in 1894, have given a clear idea of the prevalence of physical defects among children of school age and have shown us approximately what types of defects should be looked for by parents and teachers. There are marked differences between the results reported from various states and cities, as might be expected; the extent of deviation from the normal which shall be classed as a

definite defect must depend to some extent upon the judgment of the physician. In some cities the school doctors set a high standard and class as defective a child who might in another school system be regarded as normal. By striking a mean between the high and the low figures recorded for a number of cities which have good school medical organizations it is easy to obtain figures which give us a fair average for the actual incidence of more or less serious physical impairments.

The commonest defects of school children are those which appear in the form of decayed teeth. If we set a really high standard, competent dentists tell us that 85 per cent of American school children have dental defects. Even if we include, as most school physicians do, only the most serious dental defects we shall still find 20 to 40 per cent of our children with teeth in urgent need of care. Defects of vision come next, affecting from 15 to 30 per cent of all school children to a serious degree. Abnormal tonsils and adenoids will appear in 10 to 20 per cent of any average group of school children. Malnutrition is much harder to define than the local defects mentioned above, and here there is a particularly wide difference between the results reported from various cities. The figures for the proportion of undernourished children vary from 2 to 20 per cent according to the standard set. Defective hearing is found in 1 to 2 per cent of our school children; grave orthopedic defects in more than 1 per cent; and heart disease in a slightly smaller proportion. These figures are much lower than the estimates given by Cornell and other authorities; but the authors have

preferred to err on the side of conservatism by giving figures which correspond only to more serious defects.

**Remediable Nature of Physical Defects.**—We are told that by taking thought a man cannot add a cubit to his stature; but he can add pounds to his child's weight, and he can secure the removal of the greater part of the burden imposed by uncorrected physical defects. In nearly all the sorts of handicaps which have been catalogued, prompt medical care and the observance of the rules of personal hygiene will restore an affected organ to normal condition, or so supplement it that further damage is prevented and comfort and efficiency secured. Physical defects are indeed common; but they are also correctible.

The first essential after defects are found is to persuade the parents of the necessity for treatment. It will be much easier to secure coöperation, if one of the parents be present at the time that a medical examination is made. Under such conditions there is created a psychological attitude of expectancy which makes the mind receptive; while, if the first hint the parent has that an examination has been made is a card indicating the existence of some physical defect, a defense reaction is quite likely to be aroused. It will be well therefore to invite and urge parents to be present whenever an exhaustive medical examination is made, even though this involves some trouble in making plans beforehand.

In the city of Providence, where the medical examination of school children is carried out in a particularly efficient manner, it was possible to obtain the following results during the school year 1921–22: Of cases of carious and decayed teeth found by the school inspec-

tors 88 per cent were adequately treated; of cases of defective vision, 80 per cent were corrected by the prescription of proper glasses; of cases of enlarged adenoids and tonsils, 56 per cent were relieved by surgical treatment; of cases of malnutrition, 80 per cent were remedied by proper diet and hygienic care.

An excellent illustration of what may be accomplished by a systematic attempt to relieve the physical defects of school children is furnished by the records of the Department of Schools of the city of Boston. Statistics for examination of eyes and ears go back to 1907 and show that in that year 31.5 per cent of the children had defects of vision and 8.1 per cent defects of hearing. By 1916 these figures had been reduced to 12.9 per cent and 2.8 per cent, respectively. Progress made in reducing these and other abnormalities during the following five years is indicated below:

Percentage of Children Showing Specified Defects, Boston City Schools

| Year Ending June | Defective Vision | Defective Hearing | Defective Nasal Breathing | Hypertrophied Tonsils | Cervical Glands | Skin Disease | Defective Teeth |
|---|---|---|---|---|---|---|---|
| 1916 | 12.9 | 2.8 | 7.3 | 18.5 | 18.9 | 3.1 | .... |
| 1917 | 11.6 | 1.8 | 6.3 | 14.1 | 7.4 | 2.8 | .... |
| 1918 | 11.6 | 1.0 | 5.8 | 13.4 | 6.9 | 2.2 | 48.2 |
| 1919 | 11.5 | 1.8 | 6.1 | 12.7 | 4.7 | 1.9 | 44.3 |
| 1920 | 11.4 | 1.7 | 6.4 | 13.3 | 3.2 | 1.6 | 43.3 |
| 1921 | 11.1 | 1.5 | 4.7 | 12.3 | 2.1 | 1.6 | 40.6 |

**Defects of Vision.**—In only rather rare cases is the delicate machinery of the eye perfectly adjusted to its complex task. In order that one may see clearly the lens must focus so as to form its picture exactly on the screen of the retina. In some eyes the lens is curved too little or the distance between lens and retina is too short to permit of seeing things near at hand without strain, in spite of constant forced contraction of the eye muscles. Such people are called far-sighted. In other eyes the lens may be curved too much, so that while a book in the hand can be read the blackboard across the room is blurred—a condition known as near-sightedness. A third defect, known as astigmatism, is due to an irregular shape of cornea or lens so that the light rays from one direction are bent more than those which enter from a different angle.

Defects of vision are somewhat rare among very young children; but they increase steadily during the period of school life under the strain of the demands which our educational system must necessarily make upon eyesight. The results of such defects upon the health, happiness, and class rating of a child are serious and far-reaching. The stooping and strained position adopted in the effort to see clearly produces abnormalities of posture in many cases. Nervousness and irritability and in some instances definite and severe affections of the central nervous system may result.

The influence of defective vision upon success in school and in the general social life of the child is sufficiently obvious. Medical inspectors and teachers are very familiar with cases in which the correction of

visual defects has resulted in a complete revolution in the relation of a child to its work and its play. The pathetic part of it is that the child with poor eyesight has frequently no conception of its deprivation, but struggles to see the blackboard or pores over the dancing page of a book in the belief that the world has the same blurred appearance to all his fellows. The same sort of handicap prevents participation in many sports and games and robs the child of the normal pleasures of country life, the recognition of birds and flowers, and their subtle and appealing differences.

The detection of certain of the commoner defects of eyesight is exceedingly simple. Thus, difficulty in distant vision may be tested by the standard charts bearing letters of various sizes which should be visible at specified distances, and lack of clear vision of near objects by noting the ease with which fine print can be read. Other defects of vision are more subtle. Every child who has habitually "sore eyes," inflamed eyes or eyelids; who squints or blinks; whose eyes are painful in strong light; who suffers from headaches; who cannot read writing on the blackboard easily; who must hold a book less than one foot or more than fifteen inches from the face; or who must hold the head in an abnormal position when reading should be promptly examined by a competent oculist (a physician who has specialized in diseases of the eye), not by an optician (a maker or seller of eyeglasses). The prescription of properly adjusted eyeglasses is such a simple remedy for the complex evils which flow from eyestrain that it is quite inexcusable not to apply it.

**Defects of Hearing.**—The common symptoms of abnormal conditions of the organs of hearing are, on the one hand, earache or discharges from the ear, and, on the other hand, defective hearing. The simplest test for the latter condition is the watch test. The eyes should be closed and one ear stopped with a finger. Under such conditions the tick of the average watch should be clearly audible at a distance of two feet in a quiet room. The existence of defective hearing will often be suggested to the teacher by habitual inattention, an expressionless voice, or imperfect articulation.

The cause of defective hearing may sometimes be an extremely simple one, such as the presence in the outer ear of hardened ear wax which should be removed by a physician. The more serious types of defective hearing, with earaches and discharging ears, are generally due to inflammation in the middle ear following an infection of the nose or throat, as pointed out in the preceding chapter. Such inflammations are dangerous in the highest degree, and severe earache, or any earache which persists for more than twelve hours, should be referred to a physician for treatment.

**Diseased Tonsils and Adenoids.**—The tonsils are roundish organs which lie on each side of the throat in the general position indicated in Fig. 10. These organs are evidently not of essential importance, since their removal is often so highly beneficial; and they are peculiarly liable to abnormal development and to disease. Normal tonsils are not visible at all as projections at the side of the throat when one looks into the mouth, but in many children they have become so

enlarged as to be obvious even to the layman as swollen obstructions extending far out behind the back of the tongue. The character of the tissue of the tonsils is quite as important as their size. A small tonsil with irregular or "ragged" surface, providing a favorable breeding ground for bacteria, may be more dangerous than a larger one. The particular reason why enlarged or unhealthy tonsils are so important is that they furnish a gateway for the entry of disease bacteria. A marked susceptibility to local infection (tonsillitis) is the direct result, and repeated attacks of tonsillitis offer a reasonably certain indication that the tonsils require attention. Unfortunately, however, the danger does not stop with the tonsils themselves. The germs which enter at this point may find their way to other organs of the body. Gland infections and ear infections are commonly associated with tonsillar disease; and heart disease in children is very frequently, perhaps most frequently, due to this cause.

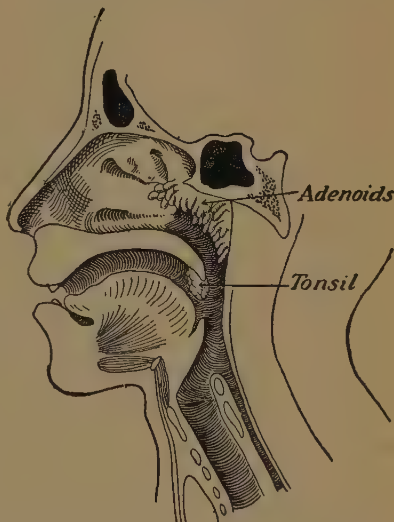

FIG. 10.—Air passages of the mouth and nose.

The adenoids are finger-like, spongy growths which

develop in the back of the throat where the passages from the nose open into it. When the adenoids become too large, they obstruct the passage of air from the nose to the throat, and children thus affected become "mouth breathers" and are apt to develop a narrow jaw and a peculiar strained expression. They sleep badly, frequently wake up crying, and are likely to be irritable and cross and backward in their studies. Adenoid growths greatly increase susceptibility to colds and infections of the middle ear.

The remedy for enlarged or diseased tonsils and for adenoids is in each case a surgical operation; and when a condition of either sort is suspected on account of any of the symptoms described above, the opinion of a competent specialist on nose and throat diseases should be obtained as to whether such an operation is, or is not, desirable. In young children it is often best to wait and see if the abnormal conditions will not disappear of their own accord. The judgment of the physician must determine the course to be pursued.

**Supervision of the Teeth of the School Child.**— The liability to tooth decay varies greatly in different individuals, partly perhaps as a result of true inherited tendencies but chiefly in relation to the diet of the mother during the period of pregnancy. In the child itself too the health of the teeth depends, first and foremost, upon an adequate diet. The second step in the care of the teeth should be the maintenance of a condition of oral cleanliness by the use of the toothbrush. In addition to both these precautions, it is essential to provide for systematic examination of the teeth by a

competent dentist and their thorough cleansing by the dentist himself or by his assistant, the dental hygienist. In no field of hygiene is the superiority of prevention to cure more manifest than in the care of the teeth. Each child should have his teeth thus examined and cleansed every six months. If this be systematically done, cavities can be filled on their first appearance, there will be little pain, and no danger of serious decay. Furthermore, the total expense will be only a fraction of what it is sure to be if the teeth are neglected until toothache indicates that the destruction of dentine has gone so far as to reach a nerve.

The first set of temporary teeth should be safeguarded with the same care as the permanent teeth. Above all, as we have pointed out in an earlier chapter, the first permanent molar, which appears at the age of six years, is of special importance since its size, position, and early appearance help to guide the other permanent teeth into proper position.

This question of the general development of the teeth as a whole suggests the fact that regular dental examinations are of great value for other purposes than the treatment of dental decay and pyorrhea. For various reasons, the teeth often develop so that they are crowded together in an irregular manner, which interferes with their efficient action in chewing and makes it hard to keep the spaces between them clean and free from decay. Sometimes—often as a result of adenoid growths—the palate becomes narrow and arched. These abnormal developments of the teeth and palate may often be corrected by special methods of dental treatment with marked improve-

ment in the patient's appearance and benefit to his health.

**Other Common Defects of School Children.**—In observing the physical condition of the school child attention should always be given to defects of posture, such as have been discussed in Chapter V. Note should also be made of such prevalent conditions as swollen or sensitive glands in the neck, speech defects, various forms of nervous instability, and heart disease. Enlarged or swollen glands may be of no serious significance or they may indicate the development of tuberculosis. They should be promptly referred to a physician for examination. Defects of speech are generally associated with deafness, adenoid growths, or mental conditions. Such defects are largely remediable, particularly in the case of stammering.

Among the common signs of mental instability are restlessness, purposeless motions, difficulty in controlling the muscles, quick, involuntary, spasmodic movements, nervous exhaustion, and undue emotional excitability. Medical supervision and above all the enforcement of a correct hygienic regime as to diet, sleep, fresh air, and the evacuation of the bowels will often bring about a radical change in the psychology of the child.

It should be remembered that a large proportion, perhaps a majority, of the problems of behavior with which the school teacher is confronted, such as stubbornness, unruliness, lack of confidence, dishonesty, while not associated with what we ordinarily call mental disease, have their roots in subconscious mental twists which can frequently be removed by the efforts of the

psychiatrist. Behavior clinics have now been established in many large cities where such problem children may be studied and helped to adjust themselves. Often, even more important are the influences which these clinics can bring to bear upon the home to remove the unwise pressure or unwise indulgence which is frequently responsible for bending the twig in the way it should not be inclined.

Finally, a special word should be said in regard to heart disease, fortunately rarer among children than most of the conditions heretofore mentioned, but of unique importance on account of its grave significance in after life. Exactly the same general principle which has been emphasized in connection with other physical defects holds in regard to heart disease—the principle embodied in our homely phrase, " a stitch in time saves nine." Heart disease in children is generally the result either of a previous attack of acute communicable disease or of infection from decayed teeth or diseased tonsils. When the primary cause has been removed, the heart, like any other organ of the body, will to a large extent repair itself under hygienic treatment. Where such a condition is found there is, therefore, no reason for undue apprehension. Under the systematic supervision of a cardiac clinic, such as have been organized in most of our large cities, the child with incipient heart disease should show material improvement and frequently complete recovery.

**The Problem of Malnutrition.**—When all is said and done, the most fundamental of all problems in the upbringing of the child is that of nutrition. The chief business of a child is to grow—to grow in mind

and character, but, first of all, to grow in strength of body, since intellect and behavior are both closely knit up with physical well-being. Of the frequency and the seriousness of malnutrition there can be no doubt. Rickets, for example, which is a very common disease of young children, is the direct result of failure of metabolism due to the lack of certain specific elements in the diet. The part played by undernourishment in lowering resistance to tuberculosis is among the most familiar phenomena in medical science. Yet, in spite of these facts, undernourished children are by no means confined to famine-stricken Russia or the suffering nations of Central Europe. A recent study of the actual diets of several thousand children in Gary, Indiana, a typical American industrial community, showed that only 10 per cent of these children were receiving completely adequate nourishment.

**Objectives of School Health Service.**—The responsibility of the school for the health of the child is, as we have seen, a threefold one: In the first place, it should provide as a regular part of the curriculum systematic instruction in the basic principles of physiology and hygiene, so that the child may understand something of the wonders of the body-machine for which he is responsible, of the dangers which threaten him, and of the ways in which he can be kept in a condition of maximum health and vigor. In the second place, the school should supply opportunities for the actual practice of health habits and particularly for supervised physical exercise and play. Finally, it should provide for the systematic medical examination of all school children so that diseases and physical de-

fects may be promptly detected and, so far as possible, cured.

The teacher, the school nurse, and the school physician all play a part in the performance of this latter task. The teacher should be constantly on the lookout for the symptoms of communicable disease—coughing, running nose, inflamed eyes, rashes, and the like—and for such signs of physical defect as have been discussed in the preceding pages. The school nurse should see daily all such children as may be referred to her by the teacher and should pass on to the physician those who are in need of his attention. In addition to these emergency examinations the school physician, with such aid as he may desire from school nurse and teacher, should make a complete and exhaustive examination of every child, at least three times during his school life, for the detection of physical defects and deficiencies. It is the duty of the school nurse to follow into the home each case needing attention, to give advice in regard to the hygiene of childhood, and to persuade the parents to have any physical defects which have been found promptly and completely remedied. There should be school clinics maintained at public expense for the correction of such defects as will not otherwise receive attention. It is the poorest sort of economy to spend money on the education of a child so handicapped by physical ill health that he cannot profit by the opportunities which are placed before him.

**The Teacher's Part in Health Examination.**—The apportionment of responsibility for the physical examination of school children between physician, nurse, and teacher varies widely in different communities. The

tendency, however, is to shift a considerable part of this burden to the shoulders of the teacher. In the state of Virginia and in the city of Detroit, for example, the greater part of the routine inspection is conducted by the teacher herself. There are two good reasons for adopting this course. In the first place, it is only by such a plan that the school population can be completely inspected in a reasonable length of time; and it is much more valuable to pick out from a large group of children the majority of those who are in serious need of care than to make a complete survey of a small group. The physician is thus freed to devote himself to the study and treatment of the children who are really in need of skilled attention.

The second advantage in delegating a large share of the health examination program to the teachers is that by this means they gain an interest in, and a comprehension of, the problems of child health which will prove invaluable in the conduct of their regular classroom work. The mental processes of the child and his development in character can be fully understood only with a picture of the limitations imposed by the physical machine in the background of one's mind.

### Topics for Investigation and Discussion

1. Remediable nature of physical defects.
2. Most common types of physical defects.
3. Results obtained by systematic attempts to relieve physical defects of school children.
4. The importance of the first permanent molar.
5. The responsibility of teacher, school nurse, and school physician in the detection and correction of physical defects.

# CHAPTER XII

## MAN AND THE MICROBE

**The Causes of Disease.**—The life process can go on only under certain rather definite conditions. These conditions are essential for all living cells, whether they be one-celled animals and plants such as we can see under the microscope or the individual cells which make up the animal body. There must be (1) moisture, (2) food, (3) oxygen, (4) a suitable temperature, and (5) sunlight. These are the positive conditions without which life is impossible. To secure these essentials and to develop the living organism itself through (6) exercise and (7) rest is the problem of personal hygiene.

In addition to these seven positive factors in health, it is also essential that the living organism should be protected against certain negative factors which directly injure it. The chief of these negative factors are: (1) mechanical injury, (2) chemical poisons, and (3) predacious or parasitic enemies. To devise means of warding off these harmful agencies is the task of sanitation.

We are striving to avoid mechanical injury by traffic regulation—since the automobile is coming to constitute one of the gravest hazards of modern life—and in general through the development of the Safety

First Campaign. We diminish the damage due to poisons by such precautions as those which are taken in industries using dangerous lead compounds and by legislation against alcohol and opium. Among the living enemies of mankind the larger wild beasts have been exterminated except in a few countries like India; but the struggle against parasitic foes remains a vitally important part of the modern public health campaign.

If we examine the statistics collected by public officials in regard to the causes of death we shall find that about half of all deaths are due to causes such as heart disease and Bright's disease, conditions which are, in part at least, associated with the wearing out of the living machine itself and the onset of old age. The other half, represented by such diseases as pneumonia and tuberculosis, are obviously due to the direct attacks of microbic enemies. The two classes of causes are of course closely interrelated. An attack of pneumonia weakens the heart, and a man with heart weakness is more likely to die of pneumonia. Yet it is roughly true that the causes of death may be divided into two general groups, the degenerative diseases and those of parasitic origin.

**Our Unseen Enemies.**—The epidemic diseases have held the attention of mankind from the earliest times, not only on account of the havoc which they cause but also because of their peculiar characteristics. Their sudden onset, striking down strong men into helplessness in a few hours; their definite course, with progressively rising fever culminating in a more or less fixed period and followed by death or more or less complete recovery; the immunity which follows an attack

and persists for a considerable time, often for life; and above all, the property of communicability by which these diseases may spread through a community like fire in a forest; these properties remained a supreme mystery until the middle of the last century.

It was Pasteur who at last cleared up this problem. Having become interested in the processes of fermentation, he proved that the decomposition of organic matter is due, not as was then generally believed, to the direct action of the air, but to the activity of living microbes, each specific type of microbe producing its own characteristic change. He overthrew the doctrine of spontaneous generation—the theory that microbes were developed *de novo* in decomposing materials under the influence of oxygen—and showed that microbes of a certain kind ordinarily come only from ancestors of the same kind, just as oak trees come only from acorns. In 1865 a widespread disease among silkworms threatened the existence of the silk industry, upon which the prosperity of certain provinces of France depends. Pasteur demonstrated that the disease was caused by the action of microbes similar to those which produce fermentation, in this case developing in the bodies of the worms and poisoning them, very much as a mold grows in jelly. In the next few years he was able to demonstrate that anthrax or splenic fever, a disease affecting cattle and men, was caused in the same way by a specific microbe; and the mystery of the epidemic diseases was at last explained.

The plagues, pestilences, and fevers, the great range of communicable diseases, from the common cold to tuberculosis, were thus shown to be merely special cases

of parasitism. All through the various groups of the plant and animal kingdoms we find that certain species have become adapted to life in the bodies of other plants or animals and at their expense. The germs of disease are simply tiny parasites belonging to the lower classes of the living world but exhibiting the same general habits as the mistletoe and other more complex parasitic forms.

**Characteristics and Activities of Microbes.**—The microbes of disease belong to various groups of plants and animals. Among the worms, which rank fairly high in the scale of animal life, we find the tapeworms, the hookworms, and the parasites which cause trichinosis. The hookworm forms a particularly good example of the way in which parasitic diseases are spread The parasite in this case is a tiny white worm, a little less than half an inch long, which lives in the intestine attached to the wall of the alimentary canal and gets its food by sucking the blood of its victim. All over the world, in tropical and semi-tropical regions, millions of men are made dull and weak and listless as a result of the damage done by these parasites. The eggs which they lay pass out with the discharges from the intestines and hatch in the soil, finding their way into the body of a new victim, sometimes with dirty drinking water or dirty food, but usually by boring in through the skin of the foot, since in these warm regions the habit of going barefoot is a very common one.

The germs of such diseases as malaria, typhus fever, African sleeping sickness, and certain types of dysentery belong to the lowest group of animals, the one-celled animals or protozoa. The germs of yellow fever,

syphilis, and relapsing fever belong to the spirochaetes, long corkscrew-shaped cells, which are sometimes classed as plants, sometimes as animals. Still others are so minute that we know practically nothing about them, except that they will pass through the walls of a fine porcelain filter. For this reason they are called filterable viruses. Smallpox, measles, rabies, and infant paralysis belong in this group.

The commonest diseases, such as tuberculosis, pneumonia, typhoid fever, diphtheria, scarlet fever, whooping cough, epidemic meningitis, gonorrhea, and plague are caused by microbes belonging to the lowest group of one-celled plants, the bacteria. These organisms are so minute that four hundred million of them could be packed into a grain of granulated sugar. They have the form of spheres, rods (from which the name bacteria is derived), or spirals; and are exceedingly simple in structure, merely masses of protoplasm inside a cell wall. Many types, however, have slender fins, or flagella, by which they may swim about, and others are surrounded by a gelatinous capsule. Some have the power of forming a spore with a thick wall around it, in which condition they can resist drying, heat, and other unfavorable influences.

In organic substances containing plenty of food the bacteria grow very rapidly, and when a single one has reached a certain size it breaks in half to form two—a process which may be repeated every twenty minutes under favorable conditions. In order to secure their food they must decompose the organic material in which they are growing. This they do by secreting ferments, or enzymes, similar to those formed by the digestive glands

and other glands in the human body. As a result of their rapid multiplication and of the formation of these powerful enzymes the bacteria set up very far-reaching changes in the media in which they grow.

Bacteria are present almost everywhere, a few floating in the air, some in almost all water, many in dust, untold numbers in the tiniest speck of earth, and millions and millions of them in the mouth, in the intestines, and on the skin. Many of them are useful rather than harmful to man, such as those which give its flavor to butter, those which change fruit juices to vinegar and, above all, those which destroy dead organic matter and change it into a form in which it can be used for food by the green plants. It is helpful to give the student some idea of the ubiquity of the harmless microbes by actual laboratory demonstration. If culture dishes of agar or gelatin can be obtained from some near-by laboratory, they may be seeded by exposing them to the air, or by adding a drop of water or a few flakes of dust. The development of visible colonies will then take place, each colony being made up of the descendants of the germ originally deposited on that particular spot. Where no laboratory is available, similar demonstrations may be made by taking slices of cooked potato and keeping them in a warm dark place on a plate under an inverted tumbler, after seeding or exposure to the air.

**Disease Germs and Their Origin.**—The disease germs differ from the ordinary harmless microbes in the fact that they are able to grow in the tissues of the human body or on its surfaces and to produce toxins or poisons which are absorbed into the blood and cause

the feeling of discomfort, the headache, the fever, and the other symptoms of disease. In gaining this power of living in the human body, these parasitic microbes have in large measure lost the ability to grow and develop in the world outside. Only in the body do they find the high temperature, the rich food, and the other conditions which they need.

It is not, however, only from sick people that we may acquire the germs of disease. In many instances these germs may continue to live and grow in the throat or the intestines of a person who has had diphtheria or typhoid fever long after he has completely recovered; and in other cases they may be growing in the body of a person who has never had the disease in question at all on account of the possession of special vital resistance. Such a well person, in whose body the germs of some disease are being cultivated and from whom they may be disseminated to others, is known as a "carrier."

The primary source of all disease germs is then to be found in the discharges from the bodies of human beings, or higher animals such as cattle, either victims of the disease or carriers. It is for this reason that the proper care of all body discharges is so important. Sputum and mouth spray in the respiratory diseases, feces and urine in the intestinal diseases, are the original sources of danger. Control of spitting and the installation of tight fly-proof privies or of water closets and sewerage systems are obviously of primary importance in their control.

**How Disease Germs Are Spread.**—Outside the human body, the parasites of disease die out rather quickly. In water, for instance, not more than one

typhoid germ out of a hundred will survive for over a week. We may therefore discredit the tales of disease due to objects infected weeks or months previously, except in the case of anthrax, the only true communicable disease whose germ can form resistant spores. The spread of germ diseases takes place by the rather direct transfer of infective material from one human being to another while the germs are still alive and virulent. There are three principal ways in which disease germs are thus carried: by personal contact, by food and drink, and by insects. These three ways may be easily remembered by three catchwords, the three F's of sanitation: Fingers, Food, and Flies.

The most important of all the ways in which disease germs are spread is by what we call contact. The catchword "Fingers" stands not only for the fingers themselves, but for all the ways in which germs may be spread by touching things. It is not necessary for people even to see each other in order to come in contact in this sense. The word is used to cover direct infection, such as occurs when one person coughs or sneezes into another's face, and also more roundabout transfer, such as occurs if germs on an infected towel are carried to another person's hands and later to his mouth. Such transfer in order to be dangerous must, however, be effected before the germs have died out with the lapse of time.

The second important way in which disease germs are spread from person to person is by means of articles of food and drink. Water or milk, if polluted and then used for drinking before the germs have had a chance to die out, may carry disease germs to hundreds of

people at once, all over a whole city. Some of the most dreadful epidemics have been caused in this way. Foods which are eaten raw are most likely to be at fault. Thorough cooking destroys disease germs; and most cooked foods are dangerous only when they have become infected after cooking. Among raw foods, many are safe because they are peeled before eating.

The third common way in which disease germs are spread is by means of insects. The catchword is "Flies," because flies are among the most important insect carriers of disease in the United States. By picking up infected material on their legs and bodies and carrying it to food, they may distribute many microbes. In warm countries, where there is a great deal of insect life, the danger of insect-borne disease is greatest; and in the tropics such diseases as yellow fever, which is spread by the bite of a certain mosquito, have, in the past, been very prevalent. Prior to the middle of the last century, typhus fever and bubonic plague periodically ravaged Europe. The former disease is spread from person to person by the louse, the latter, from the rat to man and from man to man by the flea. In uncivilized countries where bodily uncleanness prevails, typhus is still a menace. Plague takes a heavy toll of human life in India, and sporadic cases occur now and then at seaports throughout the world. Where care is taken to control filth and exterminate vermin, however, such maladies are now easily controlled.

The threefold classification given above is of course not complete or all-inclusive. Hookworm disease, for example, which will be discussed in Chapter XIV, is

caused by a worm which, when disseminated by soil pollution, bores its way directly through the skin of the foot into the body. Rabies is another example of a disease which is not in the ordinary sense spread either by contact, food, or insects. It is an infection of the central nervous system, particularly likely to occur in dogs. A dog affected with this disease becomes rabid or "mad" and rushes about biting people or other animals, introducing the germ as it bites by the saliva on its teeth. The muzzling of all dogs will quickly check the spread of rabies.

The control of the contact-borne diseases will be briefly discussed in Chapter XIII; that of the more important food-borne and insect-borne diseases in Chapter XIV.

### Topics for Investigation and Discussion

1. The bacterial theory of disease.
2. Pasteur's contributions to public health.
3. The fly as carrier of infection.
4. Methods of controlling indirect infection.
5. How public health organizations fight contagious diseases.
6. Walter Reed and his fight on yellow fever.
7. Quarantine as a weapon against contagion.

## CHAPTER XIII

### CONTROL OF THE CONTACT-BORNE DISEASES

**Older Views in Regard to Communicable Disease.**— From what has been said in the last chapter in regard to the tendency of disease germs to die out when removed from the human or animal body, it will be obvious that many of the fears which were once held in regard to the spread of these diseases are really groundless. Modern sanitary science, while it has revealed real dangers, has also freed us from many imaginary ones; and this phase of the subject should receive full emphasis in the course on hygiene.

The atmosphere, for example, which men have considered as a primary source of epidemics ever since the time of the early Greeks, cannot be a vehicle of disease, except in so far as coughing and sneezing and loud speaking produce a fine spray in the immediate vicinity of an infected person. The microbes have no wings, and even the mouth spray itself is made up of solid particles which fall to the ground rather rapidly. In many modern hospitals, contagious diseases of various kinds are cared for in the same ward, with only screens between the beds to avoid direct infection by mouth spray. So long as care is taken to prevent the spread of disease germs by the fingers of attendants, this system can be used without fear of cross infection.

Dust, too, is a much less important vehicle of disease

than was once believed to be the case. The dust of the street or on the floor of a house contains many microbes, but most of them are of quite harmless kinds. The disease germs which are coughed, sneezed, or spit out into the street or on the floor die out rather rapidly as they dry, particularly if they are exposed to air and sunlight. A few remain, of course, and if a wind stirs up a heavy cloud of dust in the street, a person may get a good deal of dust into the mouth and nose, taking in disease germs with it. This is particularly true in the case of the germs of tuberculosis, which are very widespread and are not so easily killed by drying as are many other bacteria. In general, however, the fine dust which floats in the air of a quiet room and which we see as the tiny glittering motes in a sunbeam is not a source of danger.

Objects, such as toys and books which have been handled by the sick, called fomites, are dangerous when they have been recently infected, but the possibility of acquiring disease from such objects grows rapidly less with the passage of time and after a week or so practically disappears.

**Contact Infection.**—The chief mode in which disease germs are disseminated is by more or less direct contact; and the paths by which contact infection may be spread are almost infinite in number. The most direct type of transfer is that which occurs when an infected person coughs or sneezes in the face of a suspectible victim, as may happen whenever people are crowded together in a street car or in some congested place of public assembly. From such an extreme case we pass through innumerable more roundabout types of trans-

fer in which germs pass from the mouth of the infected person to his hands, thence to door knobs, faucets, push buttons, money, and the like, and finally to the hands of the new victim or to some article of food.

Probably the chief vehicle for the conveyance of nasal and oral secretions from one to another is the fingers. If one takes the trouble to watch for a short time his neighbors, or even himself, unless he has been particularly trained in such matters, he will be surprised to note the number of times that the fingers go to the mouth and the nose. Not only is the saliva made use of for a great variety of purposes, and numberless articles are for one reason or another placed in the mouth, but for no reason whatever, and all unconsciously, the fingers are with great frequency raised to the lips or the nose. Who can doubt that if the salivary glands secreted indigo the fingers would continually be stained a deep blue, and who can doubt that if the nasal and oral secretions contain the germs of disease these germs will be almost as constantly found upon the fingers? All successful commerce is reciprocal, and in this universal trade in human saliva the fingers not only bring foreign secretions to the mouth of their owner, but there, exchanging them for his own, distribute the latter to everything that the hand touches. This happens not once but scores and hundreds of times during the day's round of the individual. The cook spreads his saliva on the muffins and rolls, the waitress infects the glasses and spoons, the moistened fingers of the peddler arrange his fruit, the thumb of the milkman is in his measure, the reader moistens the pages of his book, the conductor his transfer tickets, the "lady" the fingers of her glove. Every one is busily engaged in this distribution of saliva, so that the end of each day finds this secretion freely distributed on the doors, window sills, furniture, and playthings in the home, the straps of trolley cars, the rails and counters and desks of shops and public buildings, and, indeed, upon everything that the hands of man touch. What avails it if the pathogens do die quickly? A fresh supply is furnished each day.[1]

[1] Reprinted by permission from *Sources and Modes of Infection*, by C. V. Chapin. Published by John Wiley & Sons, Inc.

The intestinal diseases, such as typhoid fever, may be, and often are, transmitted by direct contact in a similar fashion, since polluting material from the intestinal discharges by no means infrequently finds its way to the fingers. The contact-borne diseases *par excellence* are, however, those in which the specific germs are present in the discharges from the nose and throat; and a moment's consideration will indicate that in this class are included the great majority of the communicable diseases with which we have to deal. Discharges from the upper respiratory tract are the primary sources of infection, not only in such diseases as the common cold, diphtheria, influenza, mumps, pneumonia, septic sore throat, tuberculosis, and whooping cough whose symptoms are obvious in throat, nose, and lungs, but also in the eruptive diseases, chickenpox, German measles, scarlet fever, and smallpox, and in infant paralysis, and epidemic cerebrospinal meningitis where the seat of the actual disease is in the central nervous system.

**Isolating Cases of Communicable Disease.**—Since the control of the communicable diseases depends primarily upon preventing the transfer of bodily excretions from the infected individual to someone else, it is clear that one of the first steps to be taken is the isolation of those who are known to be suffering from these diseases in such a way as to check the spread of infection from their discharges. It is for this reason that the law requires that the health department be notified at the earliest possible moment of all cases of communicable disease, which may prove a source of infection for others. For this reason sanitary codes

usually provide that physicians, teachers, householders, and others shall report all cases of disease that are "presumably communicable," without even waiting for a final diagnosis to be made. In many instances, as in diphtheria, typhoid fever, tuberculosis, and malaria, the health department laboratory can provide invaluable assistance in establishing the diagnosis by special laboratory tests.

As soon as a case of communicable disease is reported the Board of Health posts a placard on the premises to warn people not to enter and takes steps to see that the patient is properly isolated in a separate room, away from the rest of the family. The nurse, mother, or other person in charge must take the greatest care that nothing soiled by the discharges of the patient leaves the room without first being disinfected in such a way that the disease germs will be destroyed. All discharges from the nose, mouth, and ears of the sick person should be received on clean cloths which can be burned or disinfected with chemicals. Handkerchiefs, bedding, forks, spoons, dishes, and anything else which may have been infected by the patient should be boiled or otherwise disinfected. No one, except the doctor and the person caring for the patient, should come into the room.

Everyone knows that diphtheria, scarlet fever, smallpox, and typhoid fever are serious, but many people think that measles and whooping cough are merely "children's diseases" and are not of much consequence. This is a great mistake; in many cities more people die of measles than of typhoid fever, and more die of whooping cough than of scarlet fever. These diseases

are particularly deadly for young children, and the greatest care should be taken to protect them from infection.

Each communicable disease has its own definite period of duration, and experience teaches that a certain number of days or weeks must pass before it is safe for the patient to mingle with other people. Irrespective of any time limit, isolation must always be maintained until all active symptoms, such as discharging ears, have ceased. In whooping cough, however, the cough is an after effect which often persists long after the active disease process has ceased. It is most important that isolation regulations should be made as little burdensome as is consistent with safety. In diphtheria, cerebrospinal meningitis, and typhoid fever, the disappearance of the infecting organism can be established by laboratory tests. In the other common diseases we rely on an arbitrary time limit which experience has shown to be satisfactory. The standard isolation periods are as follows: chickenpox, until primary scabs have disappeared; German measles, eight days from onset; measles, seven days from onset; mumps, until glands have returned to normal size; infant paralysis, twenty-one days from onset; scarlet fever, twenty-eight days from onset; smallpox, until disappearance of all scabs and crusts; whooping cough, four weeks from onset or two weeks from first characteristic whoop. The exact periods fixed for the isolation of various diseases differ in different states, and the teacher should always be familiar with the specific regulations in force in her own community.

When the isolation period is over, small objects

which have been handled by the patient should be destroyed or cleansed by disinfection or washing. The room should be aired and if possible flooded with sunlight. The woodwork and plain furniture should be washed and the floor scrubbed with hot water and soap. Fumigation is generally unnecessary. The time of real danger is during the course of the disease, not afterward. If bodily discharges have been disinfected day by day, the few germs which may have escaped immediate destruction will have died out with the lapse of time; and, if the isolation procedures have not been effectively practiced, infection is already fairly certain to have spread to susceptible members of the family.

**Supervision of "Contact" Cases.**—Quite as important as the care of the first case of disease is the supervision of other members of the family, schoolmates, or associates, who have been in contact with the patient and may already have become infected by him before his condition was recognized. It happens, unfortunately, that many diseases, like measles and whooping cough, are particularly catching in the very early stages, so that it is too late when they are detected to prevent the transfer of infection to a second crop of cases. By careful supervision of the contacts it is generally possible, however, to prevent the transmission of disease to a third and still larger group; and this is one of the main objectives of modern epidemiology.

The duty of the health officer is to exclude these contacts from school and places of assembly and to keep them under observation until it is certain that they are not "coming down" themselves. In some

diseases, like diphtheria and epidemic cerebrospinal meningitis, we can discover by taking cultures whether a contact case is a carrier or not. In other instances the contacts should be quarantined for the incubation period of the disease—that is, the period which elapses between the time of infection and the first obvious signs of illness. The length of this period varies for different diseases as follows:

| Disease | Incubation Period |
|---|---|
| Cerebrospinal meningitis | 2 to 10 days |
| Chicken pox | 14 to 21 days |
| Diphtheria | 2 to 5 days |
| German measles | 10 to 21 days |
| Measles | 7 to 18 days |
| Mumps | 4 to 25 days |
| Poliomyelitis | 3 to 10 days |
| Scarlet fever | 2 to 7 days |
| Small pox | 12 to 14 days |
| Typhoid fever | 7 to 23 days |
| Whooping cough | 14 days |

Where a contact is known to be immune as a result of a previous attack, the regulations need not generally be enforced. The greatest care should be taken to watch contact cases which are in quarantine and to enforce isolation if any symptoms suggestive of communicable disease occur.

**Signs of Communicable Diseases.**—The fact that so many diseases are particularly contagious during their early stages makes it important that the teacher should always be on the lookout for the common signs which are likely to indicate the onset of a case of

communicable disease. Measles, for example, begins like an ordinary cold in the head, with sneezing and running nose and eyes. Generally people think it is just a cold, and the child who has it runs about and plays with other children as if nothing were the matter. Yet it has been found that there is far more danger of spreading the germs of measles at this time than there is later, when a rash has appeared and the patient has been put to bed. Children should never be sent to school, and should not play with other children, when they have any of the signs which may mean an attack of a communicable disease, particularly if there is reason to think that they have been exposed to infection.

The principal signs, any one or more of which might indicate the beginning of an attack of communicable disease, are as follows:

| | |
|---|---|
| Coughing | Weak, tired feeling |
| Sneezing | Watery eyes |
| Running nose | Headache |
| Sore throat | Vomiting |
| Feverishness | Diarrhea |
| Rash or spots of any kind | Swelling or pain back of or under the ears |

**The Sanitary Conscience and the Aseptic Sense.**— If the spread of germ diseases is to be controlled it is essential to cultivate in the minds of our school children that sense of responsibility for exposing others to infection which has been called "the sanitary conscience." It is not a sign of courage for a person who is "coming down" with a communicable disease to keep up and about and to mix with others; it is a sign

of folly and inconsiderateness. One's work may be so vitally important as to justify taking risks and exposing other people to danger, but as a rule such risks are not warranted. It must be remembered that even a cold in the head may lead to very serious results in the next person who "catches" it; and above all the greatest care should be taken never to expose young babies to infection. Measles and whooping cough are five times as deadly to infants under one year of age as to children over five.

The surest safeguard against communicable disease lies in the development of "the aseptic sense," an instinctive habit of keeping things that are not clean away from the mouth and nose; and from the standpoint of bacteriology everything that has not been specially cleansed must be regarded as a possible source of danger. It is an unpleasant truth that every time we come down with a cold it is because we have put the discharges from someone else's mouth or nose into our own, and the actual carrying out of the following two simple rules would probably do more than anything else for the prevention of communicable disease.

I. Nothing should ever go into the mouth except things to eat and drink and the toothbrush. Nothing should ever go to the nose except a clean handkerchief.

II. The hands should be thoroughly washed before meals and before eating any food handled with the fingers. The common towel and the common drinking cup should be rigorously excluded from home and school.

**Immunity and its Control.**—In addition to the steps which may be taken to prevent the spread of germ

diseases from one person to another we have an even more effective way of controlling these diseases by making people immune against them through the use of vaccines and sera. There is a general type of vital resistance against disease which may be inherited and which varies markedly in different races. Quite distinct from this sort of vital resistance is the specific immunity which follows when a person recovers from a communicable disease, an immunity which protects him against another attack, sometimes only for a few weeks but frequently for life. Such acquired immunity may be developed through attacks of disease so slight as to be scarcely noticeable or quite overlooked. Investigations, to which reference will be made later on, have shown that a very large proportion of the population gradually acquires immunity against diseases like diphtheria and tuberculosis through the occurrence of such very light attacks. The discoveries of bacteriology have made it possible in certain instances to produce a similar immunity at will and without waiting for a natural attack of disease to occur. The first example of the successful control of a communicable disease through the creation of artificial immunity was the practice of vaccination against smallpox, introduced by Jenner in England in 1796. It is difficult for us nowadays to realize the terrors of smallpox in the days before this discovery. Its ravages were almost universal, and about one person in every ten died of the disease. Jenner's discovery was made in the following way: In the rural district in which he lived, many of the cattle were infected with a mild eruptive disease known as cowpox, and this disease

was often contracted by the men and girls who milked the cows. There was a common belief that those who had had the cowpox were resistant against smallpox, and this theory Jenner tested out and found to be correct. During the years 1799–1801 over three thousand different persons were vaccinated—or treated with cowpox material—at the London Smallpox Hospital with the demonstration of complete protection in every case. As soon as vaccination became general, smallpox disappeared; and it persists today only in countries like Russia and certain parts of the United States where vaccination is neglected. There is perhaps no other procedure in medicine which rests upon so ample and sure a basis of direct experimental evidence as that of vaccination.

Since Jenner's day it has been shown that cowpox is really the form taken by smallpox in the cow, but that by exposure to the body fluids of the cow the germ of smallpox has permanently lost its power to produce active disease while retaining its power to stimulate the human body so as to render it immune. The effect is not lifelong or absolute. It wears off with the passage of time, so that vaccination should be repeated about once in seven years. Yet even among those who have been vaccinated long before, the great majority resist infection and those who do contract the disease suffer in a relatively mild degree.

It was Pasteur who extended the principle discovered by Jenner and made it applicable to a great number of other diseases. He had isolated the germ of a disease of fowls known as chicken cholera and proved that it could be produced at will by the inoculation with

this germ. On one occasion he used an old laboratory culture for such an inoculation and found that it had become so weakened by long standing that the fowls no longer developed the typical disease; but when some of these same fowls were later inoculated with a fresh virulent culture they were found to have developed an immunity against its attack. The fertile mind of Pasteur at once grasped the possible analogy between this phenomenon and Jennerian vaccination. Was it possible, as a general method of controlling communicable disease, to prepare weakened or attenuated viruses which would be robbed of the power of harm but would retain the ability to stimulate the body so as to produce in it a state of immunity similar to that following an actual attack of disease?

Pasteur's next step was taken in connection with a disease of cattle known as splenic fever, or anthrax. After many eager and anxious months he succeeded in producing a vaccine for this disease, by exposing the germs to heat, a vaccine so effective that it would confer an almost complete immunity without harming the treated animals. On May 5, 1881, a public demonstration of this new procedure was given at the farm of Pouilly le Fort near Melun, France, as a result of the challenge of the skeptical editor of a veterinary paper. Twenty-five sheep and six cows were inoculated with the protective vaccine, and after a suitable time these animals and a similar group of untreated ones were inoculated with the virulent virus of splenic fever. The final inoculation took place on May thirty-first. Although Pasteur had boldly predicted, " The twenty-five unvaccinated sheep will all perish; the twenty-five vac-

cinated ones will survive," he was a prey to intense anxiety when the crucial test came. On the morning of June second, however, a telegram arrived from the once hostile veterinarian, announcing "stunning success," and when Pasteur arrived at the farm in the afternoon amid the acclamation of the delegates from medical and veterinary and agricultural societies who crowded about the enclosure, twenty-two of the unvaccinated sheep were dead and two others were breathing their last, while the vaccinated animals were all in perfect health.

This experiment of Pasteur's was probably the most beneficent thing that man has ever done for the animal creation, since millions of cattle, sheep, and other domestic animals have been saved from suffering and death by the use of such vaccines. Furthermore, by this demonstration, the broad principle was established that the production of immunity by the injection of weakened germs or killed germs or extracts from dead germs is a general and not an isolated phenomenon. We have today as a result of Pasteur's discovery vaccines for rabies, cholera, plague, typhoid fever, and many other diseases. The vaccine which protects against typhoid fever is of special importance. It is prepared in a very simple fashion by heating a culture of typhoid bacilli to a point which will kill the germs, without destroying their immunizing power. By the application of vaccine treatment the typhoid rate in the United States Army was reduced to one-tenth of its former figure between 1909 and 1914; and the freedom from this disease on the part of the armies during the World War was chiefly due to the use of this preventive.

**The Anti-Toxic Sera.**—Vaccines, as we have seen, are substances containing principles derived from a disease germ, which when introduced into the human body stimulate the body cells to the production of a ~~state of active immunity.~~ Such an active immunity is generally more or less permanent, but it takes time to become manifest. Therefore, vaccines are commonly used for the prevention of disease rather than for cure. If, however, we can vaccinate an animal against some disease germ and produce in it a state of active immunity; if then we withdraw some of the blood of the animal containing the immune principles; it should be possible to inject the animal blood serum containing such principles directly into the body of a patient suffering from the disease in question so as to neutralize the poison produced by the invading germ and thus favor recovery by producing an immediate, though temporary, passive immunity. Such antitoxic sera are now available for the treatment of a considerable number of communicable diseases, such as diphtheria, scarlet fever, tetanus, epidemic cerebrospinal meningitis, certain forms of pneumonia, and yellow fever.

In the case of diphtheria, for example, the toxin, or specific poison, of the diphtheria bacillus is injected into the horse in gradually increasing doses, until the horse is able to sustain a dose several thousand times as great as that which would prove fatal to an untreated animal. During this period the tissues of the horse have been producing larger and larger amounts of diphtheria antitoxin—a substance which specifically neutralizes the toxin. The horse is then bled, and the clear blood serum containing the antitoxin is separated,

purified, and standardized. If this antitoxic serum be given at a sufficiently early stage of the disease, recovery is practically certain. The effect of its use has been to cut down the death rate from diphtheria in the general population to less than one-fourth of what it was before this treatment was available.

In dealing with diphtheria we have a more complete machinery for control than is available in the case of any other communicable disease. In the first place, we can detect the carriers of the diphtheria bacillus with certainty by a simple bacteriological examination. In the second place, we can determine whether a given individual is already immune against diphtheria or not by what is known as the Schick test. In this test a very minute amount of diphtheria toxin is injected into the skin. If the person is immune no reaction occurs, while if he is not immune a characteristic reddened area develops. Thirdly, we can cure diphtheria when it has begun to develop, by the use of antitoxin; and finally, we can protect those who have not yet become infected and are not already immune by the injection of a mixture of toxin and antitoxin which acts as a vaccine in stimulating the development of a state of active immunity against the disease.

When a case of diphtheria occurs it is a simple matter to test all those who have been in contact with the case, by bacteriological culture and by the Schick test. Those who are already immune and not carriers need no further attention. Those who are immune but have diphtheria bacilli in their throats should be isolated for the protection of others. Those who are susceptible but not carriers should be given toxin-

antitoxin to protect them against possible future infection; those who are carriers and susceptible should be isolated and given antitoxin, since they are in immediate danger.

It is better policy to take measures to protect children against diphtheria without waiting till a case actually appears in their family or in the schoolroom. In New York and many other cities campaigns have been carried out on an extensive scale for the Schick testing of the general school population in order to determine which children are already immune and to immunize those who are not with the toxin-antitoxin mixture. These wholesale tests have brought out the very interesting fact that infants of three months or less generally possess a temporary immunity inherited from the mother. The proportion of immune infants drops from 85 per cent during the first three months to only 30 per cent in the second year as this inherited immunity wears off. From this point the proportion of immune children gradually increases, in New York City up to 85 per cent again after twenty years of age, no doubt as a result of slight unnoticed infections which often occur in crowded communities. In rural districts and in certain private schools where children are protected from chance exposures the proportion becoming immune will be very much less. The use of toxin-antitoxin for protecting non-immune school children has proved brilliantly successful. In Auburn, New York, for example, the number of days of school attendance lost as a result of diphtheria was 22,438 in 1921–22 and only 1189 in 1922–23 after a vigorous Schick testing and toxin-antitoxin campaign. It was

estimated that the value of the educational time thus salvaged was over $10,000.

The best of all methods of fighting diphtheria is to go back to a period long before the beginning of school life. Four-fifths of all deaths from diphtheria occur in children under five years of age, so that we cannot hope to accomplish very much without securing the toxin-antitoxin treatment of children of the "run-about" age. Since children in the second year are rarely immune against diphtheria, it is a waste of time in this case to use the Schick test. What we should do is to immunize all children about the time of their first birthday with the toxin-antitoxin mixture; and just so far as this is done will diphtheria cease to take its toll of over 12,000 lives a year in the United States.

### Topics for Investigation and Discussion

1. Imaginary fears in regard to the spread of disease that are being proved groundless by modern sanitary science.
2. The teacher's opportunity for control of communicable disease.
3. The development of "the aseptic sense" as a safeguard against communicable disease.
4. The results of the creation of artificial immunity.

# CHAPTER XIV

## COMMUNITY SANITATION

**Water Supply and Water Purification.**—So far, ~~we~~ we have been considering, in the main, health problems which relate to the individual. Personal hygiene is almost wholly a matter of daily conduct, and even the control of the contact-borne diseases depends chiefly upon what goes on in the individual home. There is another set of health problems which can be solved only by organized community action, those for example which relate to water supply, sewage, and refuse disposal and the elimination of the insect carriers of disease.

An ample supply of pure water is one of the primary needs of any community. The water which falls to the ground in the form of rain divides itself into two portions; part flows off in streams and ponds as surface water, and part sinks into the soil and becomes what we call the ground water, moving slowly through the earth toward a lake or river bed or toward the ocean. We may obtain our water supply either from surface sources, by gravity or pumping, or from the ground, by driving wells or collecting the flow of springs. Surface waters are always potentially dangerous sources of supply, since the rain washes all sorts of wastes into them. Among these wastes washed in

from the surface of the ground, there are always likely to be infected intestinal discharges; while the larger streams and lakes are subject to even more direct pollution from house drains and sewers. Ground waters are much less liable to pollution, but in clayey or rocky soils sewage may find its way into wells through fissures in the ground. All surface waters and some ground waters, therefore, require purification to make them safe for use, as evidenced by numerous disastrous water-borne epidemics of typhoid fever and cholera in the past.

The first method of purification which can be utilized is storage. We have already pointed out that, if water is held for a considerable period, the intestinal bacteria present die out, so that after a lapse of several weeks even a highly polluted water will be rendered harmless. In supplies drawn from lakes this purifying agency always enters to a more or less considerable extent; but since local currents due to wind action or some other condition may carry fresh pollution for a long distance in a short period of time, this method of purification must be watched with the greatest care and controlled by constant bacteriological examinations.

A second and more trustworthy method of treating polluted water is known as slow sand filtration, and consists in passing the water slowly through a bed of suitable sand, from four to six feet deep. Such a sand bed acts as a filter, the bacteria present in the water clinging to the sand grains and to the fine material and the bacterial growth which gathers at the surface of the bed, so that the effluent which flows off at the bottom will be as pure as good spring water. Even such pol-

luted waters as those of the Merrimac and the Hudson rivers may in this way be made quite safe for use.

Since sand filtration is so efficient it is obvious that well waters, if they have passed through sandy soil, should be purified in the process. In many farmyard wells, however, the construction at the top is so loose that surface water finds its way freely in without any filtration at all, a condition which should be avoided by building a curb rising above the surface of the ground and closed by a tight cover.

The slow sand filter works admirably with the clear river waters of New England. In the Middle West, however, the rivers often come from regions where the soil is largely clay. Such waters carry a fine turbidity which interferes very seriously with the process. For such waters we have a third method of purification, which is called rapid mechanical filtration. In this mode of treatment we again use a sand filter but reinforce the filtering action of the sand by adding a chemical, such as alum, which forms a special filtering layer on the surface of the sand, and then pass the water through at a much more rapid rate.

Finally, water may be purified by chemical disinfection, the process generally used consisting in the addition either of bleaching powder or of chlorin gas. Chlorin is a powerful oxidizing agent, which destroys the vast majority of the bacteria present in a very few moments without producing any appreciable change in the final composition of the water. The chief limitation to the use of this process lies in the fact that in order to be effective the amount of chlorin added must be nicely proportioned to the organic matter present

in the water. If the organic content of the water increases suddenly, as is the case with river waters after a rain, the chlorin will be used up by the organic matter before it can kill the bacteria. The ideal field for chlorin treatment is to put the finishing touches on a water which has already been fairly well purified by storage or filtration. In combination with one or the other of these processes it is used by a large majority of cities in the United States.

**Milk as a Vehicle of Disease.**—In most well-governed cities the public water supplies are now carefully guarded. Milk, too, requires systematic protection in order that it may not prove a source of disease. If great care is not taken, there are many chances for dirt to get into milk, from the body of the cow, from the stable, from the hands and clothes of the milker, from cans and bottles, and in the various steps of cooling and bottling. The ordinary germs from dirt do not die out in milk, as they tend to do in water, but multiply so rapidly that if the milk is not kept cold there are soon many millions in a thimbleful; and even the disease germs may multiply in milk at times. The souring of milk is the result of the activity of certain microbes growing in it. The dirt germs often affect milk so as to make it poisonous to young children. The chief cause of sickness among babies in summer is bacteria-laden cow's milk.

In addition to the common dirt germs, the germs of tuberculosis may be present in the milk from diseased cows, and it may contain the microbes which cause such diseases as typhoid fever, diphtheria, and sore throat, derived from sick people or disease carriers who

handle the milk. Such dangers can be completely avoided by pasteurization, which means heating the milk to 145° F. and keeping it that temperature for a period of thirty minutes. This process kills all the disease germs and most of the other germs in milk, without altering its taste or nutritive value in any way, except that one of the vitamins present is partially destroyed. On account of the danger of microbic disease, all milk for drinking, particularly in the case of infants and young children, should be made safe by pasteurization. When babies are fed only on pasteurized milk the reduction in vitamin content should be made up by giving orange juice or tomato juice.

Where properly pasteurized milk cannot be bought, the next best thing is to get good, clean bottled milk and pasteurize it in the home. After the milk has been pasteurized, it should be cooled at once. Though pasteurization kills all the disease germs, it does not kill all other germs, and those that are left will increase and will spoil the milk if it is not kept cool.

**Other Sanitary Problems of Food Supply.**—Besides water and milk, there are certain other foods which may carry disease germs in such a way as to cause widespread epidemics. Of these, the most important are oysters and other shellfish. Such foods have frequently been responsible for cases of typhoid fever, when taken from places where they had been polluted with sewage.

Almost any food may be infected in the processes of preparation by a "carrier in the kitchen," like the famous Typhoid Mary, a cook who caused half a dozen epidemics in and near New York some years ago.

Cases of food poisoning are generally caused in this way by the presence of specific germs derived from human or animal sources, rather than by the common germs of decay, which are not as a rule particularly harmful in themselves. In order to guard against food-borne disease the greatest cleanliness should obviously be used in the handling of foodstuffs and every effort made to keep those who are suffering from some communicable disease away from contact with them.

In order to prevent the loss of good food by spoiling, it is important that all foodstuffs should be carefully guarded against decay. Since decay is caused by the growth of microbes, anything that will keep microbes from growing will keep foods from spoiling. One way of doing this is by canning or preserving. In such processes the microbes already present in the food are killed by heat, and the can or jar is then sealed so that no more can get in. Cold is another excellent preservative. It does not kill the germs, as high heat does, but it checks their growth. In cold storage warehouses where food is kept at freezing temperature or below, it will remain sweet and good for months or years.

**Hookworm Disease and Other Disorders Due to Soil Pollution.**—We have discussed in earlier chapters the general dangers inherent in the improper disposal of human excrement. The most important disease which is spread in this way is hookworm disease, which is so common in tropical and semi-tropical countries. The International Health Board estimates that out of a total of some seventeen hundred million people in-

habiting the globe, over nine hundred million live in countries where hookworm infection is a serious menace to health and working efficiency. Hookworm disease is an example of a communicable disease in which the process of infection is so clearly understood that it gives us an excellent picture of what goes on in the case of other maladies whose history has been less completely studied. The parasites in this case are tiny worms about one-third of an inch in length which attach themselves to the walls of the intestines and suck the blood of their victim, sapping his energy and lowering his vitality in proportion to their numbers. They reproduce and lay eggs which pass out with the intestinal discharges. The young worms which hatch from these eggs are spread about in the soil by casual disposal of excreta and penetrate into the bodies of new human hosts in a very curious fashion. In the warmer countries the majority of the agricultural population go barefoot. These worms bore their way through the skin of the foot and after thus entering the body find their way to the intestines where they attach themselves and continue their normal parasitic existence.

There are two general methods which may be used in the control of hookworm disease. By the use of certain specific drugs it is possible to destroy the worms in the intestine and thus cure the individual patient. The fundamental prevention of this disease obviously depends, however, on the provision of proper facilities for the care of human excreta so as to avoid the pollution of soil and the consequent infection of new victims. The same measures are of fundamental importance,

even in cooler climates where hookworm disease does not occur, in preventing the spread of typhoid fever and other intestinal disorders which are frequently transmitted as a result of soil pollution, overflowing cesspools, or outside toilets so constructed that flies may gain access to the excreta which they contain. Where there is no pressure supply of water in the house, the only thing that can be done is to construct privies tightly, with careful screening to exclude flies, and with provision for the care of the excreta themselves either in pits or in tight removable receptacles. Where there is a pressure water supply but no sewerage system, cesspools must be used and emptied at regular intervals unless they are in sandy soil which permits of the leaching out of the liquid contents. Best of all, of course, is the connection of water closets with sewerage to carry all the liquid wastes quickly away in a system of closed pipes.

**Sewerage and Sewage Disposal.**—The installation of a sewerage system, while it solves the problem of the individual householder in the most satisfactory manner, leads to the creation of a new problem of municipal sanitation—that of the treatment of the sewage itself. Somewhere at the end of the sewerage system the accumulated wastes from all the dwellings must somehow be disposed of. The sewage of an average American city will amount to over 100 gallons a day for every person in the population. What this means may best be illustrated by saying that if the daily sewage discharge from New York City were collected in the bed of a river 100 feet wide and 10 feet deep, it would completely fill it for a distance of 13 miles in one day.

It is true that this river of sewage is mostly water; but the solid matter which it carries with it, though less than one one-thousandth of the total, would, in the case of New York City, be equal to 600 tons a day.

The damage done by city sewage which is not properly disposed of is of two distinct kinds. In the first place, the disease bacteria, which the sewage from any large community is sure to carry, may pollute water supplies or may cause disease among those who bathe in the polluted waters or consume shellfish taken from them. In the second place, the decomposition of the organic material in the sewage may produce offensive conditions along the course of the river or harbor into which it is discharged.

The first of these problems, which concerns the danger to health, is often solved in some other way than by the purification of the sewage. It may frequently be more economical and more effective to purify the water which is taken out of a stream for drinking rather than to attempt to secure a complete purification of all the sewage which enters it. Shellfish from a polluted area can be made safe by appropriate treatment, and it may prove a better policy to abandon a given bathing beach rather than to spend money on an elaborate system of sewage treatment. In one way or another, however, such menaces to health must always be controlled.

In any case the sewage of a city should be so disposed of that no nuisance shall be created. Sometimes no special treatment may be necessary. Where a small volume of sewage is discharged into a large stream or into the ocean, the intestinal bacteria may die out and

the organic matter be disposed of by natural processes without danger of offense. As the amount of sewage grows greater in relation to the volume of diluting water, it becomes necessary to reduce the burden of polluting material. We can remove the larger suspended solids in the sewage by passing it through screens, or effect a more complete reduction in suspended matter by the use of large tanks in which the finer solids settle out. The "septic tank" and the "Imhoff tank" are settling basins of this kind. In these the solids which accumulate on the bottom are digested and reduced in amount by the action of putrefactive bacteria. Finally, if a higher degree of purification is necessary, the organic material in the sewage may be oxidized and turned into a harmless and inoffensive mineral form (nitrates) by the action of nitrifying bacteria. This sort of purification takes place in nature whenever manure is plowed into the soil or when the untidy housewife throws kitchen slops out from the back door. On a large scale we can make it more effective by disposing of sewage on special beds of sand or broken stone or in aeration tanks. All these devices involve the cultivation in the sand beds, or on the stone filters, or in the aeration tanks, of special types of bacteria which, in the presence of sufficient oxygen, oxidize the organic matter of the sewage into nitrates. In the case of the sand filter the sewage is applied in intermittent doses, the air being drawn in after each application. In the stone filters, called trickling beds, the sewage is discharged from spray nozzles up into the air, and then allowed to trickle downward over the stones on which bacterial films are

growing. In the aeration tanks, air is blown directly in through porous plates at the bottom and sewage, oxygen, and nitrifying bacteria are thus intimately mixed.

By a proper combination of these various devices it is possible to secure any result which we desire in the purification of sewage. There is one case of a village on the shores of the water supply of a large city whose sewage is first settled, then passed through two successive stone beds, settled again, passed through a sand filter and then disinfected with chlorin, producing an effluent purer and better than the water supply into which it is discharged. Such elaborate treatment is, of course, very rarely needed; and in a given case the aim should be to protect the public health and secure freedom from nuisance at the minimum possible cost, in view of all local conditions, remembering the old maxim that "an engineer is a man who can do for one dollar what any fool can do for two."

**The Solid Wastes of the City.**—Besides the liquid wastes of the city which flow away in the sewers, there are solid wastes which must somehow be disposed of. There is the garbage or kitchen waste, the ash from fires of all sorts, and the rubbish, such as waste paper, sticks, tin cans, and bottles. The most primitive method of disposing of all these various kinds of refuse is by dumping on land. Refuse dumps are fairly certain, however, to become nuisances, sources of dust and bad odors, and sometimes of disastrous fires. Dumping at sea is better for cities which can arrange for it, but care must be taken that floating materials are not deposited where they can be washed

back upon neighboring beaches. The best way to dispose of mixed refuse—garbage, ashes, and rubbish—is to burn it in a high-temperature incinerator. If the various kinds of refuse are collected separately, the clean ashes may be used for filling in low land; the rubbish may be sorted and the papers and cans sold to manufacturers; while the garbage can either be fed to hogs—often a satisfactory and economical procedure—or treated in a reduction plant where the grease and fertilizing materials which it contains are extracted.

Dirty streets and dirty back yards are unsightly and may indirectly contribute to ill health, by attracting rats or by breeding flies which carry disease. When the infection of bubonic plague is present, and at seaports where it is likely to be introduced, special campaigns against rats should be undertaken, by trapping and poisoning them, but, above all, by starving them out—protecting houses, granaries, food stores, and similar places against their entry by rat-proof construction and clearing up all filth outside which may serve them as food. As a part of the course in sanitation children should be interested in the problems of municipal cleanness and encouraged to do their part in keeping the community in order.

**The Filthy Fly.**—One of the chief reasons for municipal cleanness is to be found in the importance of avoiding fly-borne disease. Intestinal infections, as we have seen, may be spread by water, by milk, by foods, by direct contact, and in various other ways; but if conditions are such that flies may gain access, on the one hand, to human excrement and, on the other, to food, these insects may and do play an

important part in their dissemination. During the Spanish War, when one in five of our volunteer soldiers suffered from typhoid fever, the fly was the chief agent at fault. Dysentery and diarrhea may also be transmitted in a similar fashion. Even in sewered cities like New York flies play a definite rôle in the spread of infant diarrhea.

The most effective means of dealing with insect-borne disease is always to be found in controlling the breeding of the insect itself; and for this purpose we must know something of its habits. The ordinary house fly breeds by preference in horse manure but will lay its eggs in almost any kind of moist decaying organic matter. The larvae which hatch from these eggs are whitish maggots which crawl about and feed in the manure or other material for five days to a week and then burrow down into the ground or out into the dry edges of the manure heap where they go into the pupa stage, a little brownish chrysalis, like that which we find inside the cocoon of a moth. From this pupa after a few more days the adult fly emerges.

The control of the fly, therefore, depends on the elimination of decaying organic matter in which it may breed, and particularly on the care of stable manure. This should be stored in covered, tight-bottomed bins from which the larvae cannot escape and removed from the vicinity of human habitations at least once a week. Adult flies may be reduced in numbers by the use of traps which are made with a wire cone having some attractive bait below and opening at its smaller end into a cage of wire. The flies after seeking the bait pass upward through the cone

toward the light, get into the cage, and are unable to find their way out again. The elimination of breeding places is the most fundamentally effective way of controlling all insect pests, but it is very difficult to carry out such measures with absolute completeness in the case of the fly. It is therefore important to screen the house—and particularly the kitchen, dining room, and nursery—so as to exclude flies and, where these insects are abundant, to destroy those which do enter, by the use of fly paper.

**Mosquitoes and Malaria.**—The most important of the insect-borne diseases from a world-wide viewpoint, and considering sickness and disability as well as direct mortality, is no doubt malaria. Sir William Osler, the great physician, justly called malaria "the greatest single destroyer of the human race." The secret of this mysterious malady—the bad air disease (*mal aria*)—was revealed in 1898 when it was discovered that the infecting germ was transmitted from one person to another by the bite of mosquitoes of the genus *Anopheles*, and in no other way. Its connection with night air, marshy areas, and excavated soil was at once explained by the fact that these mosquitoes breed in stagnant water, and there was placed within our grasp a simple and effective method of controlling this disease through measures directed against its insect host.

The eggs of the mosquito are laid upon the surface of the water, and the larvae which hatch out are little brownish or blackish wigglers which jerk themselves about in the water in a characteristic fashion and come up to the surface to breathe. After a few days the larvae change to pupae, little seed-like objects which

still move about actively but do not feed, and from these pupae the adult mosquitoes emerge, standing on the floating pupa skin at the surface of the water until their wings have dried and they can fly away.

If the school is troubled with mosquitoes, it is a simple matter for the children to search out their breeding places by hunting for small protected bodies of standing water, clogged streams, flooded areas,

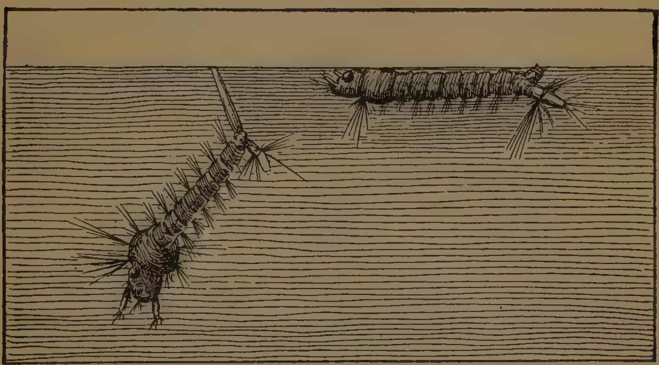

Fig. 11.—Resting position of the larvæ of the common mosquito, Culex (left), and the malarial mosquito, Anopheles (right).

pools, rain barrels, and the like, and dipping up water in a white lined vessel to see whether it contains wigglers. The *Anopheles* larvae can be distinguished from the larvae of the common mosquito, *Culex*, by the fact that when resting at the surface of the water they lie parallel with it, while the *Culex* larvae hang down at an angle, touching the surface only with their long breathing tubes (see Fig. 11). The adult mosquitoes are also easily distinguished by the fact that *Anopheles* has spotted wings and *Culex*, clear wings, and by their

resting position on a wall. *Culex* stands in a slightly humped position, its head pointing toward the wall and its body parallel with it, while *Anopheles* stands at an angle with the wall, beak, head, and body all in a straight line (see Fig. 12).

The most effective way of controlling mosquitoes is obviously to drain the marshes and remove all the small accumulations of stagnant water, for these insects will not breed in large open ponds or clear flowing streams. Where drainage is unduly costly the wigglers may be destroyed by spraying oil on the marsh waters, since the oil spreads in a thin layer over the surface and makes it impossible for the insects to get to the air to breathe, or by stocking small ponds with fish which eat the wigglers. Screening of houses is of great assistance in the control of malaria. We have still another means of combating this disease by the systematic use of quinin to cure those who are ill, to eliminate the germs from the blood of carriers, and to protect those who are well against their entrance.

FIG. 12.—Resting position of common mosquito, Culex (right) and malarial mosquito, Anopheles (left).

The International Health Board has carried on a series of striking demonstrations of the value of malaria control measures in various southern states and tropical countries and has demonstrated that by the treatment of mosquito breeding areas, by screening, or by the systematic use of quinin, it is possible to eliminate from four-fifths to nine-tenths of the malaria in the worst infected districts at a cost which generally amounts to between fifty cents and a dollar per inhabitant per year. The money loss due to malaria in the United States has been estimated at $100,000,000 annually. It is obvious that it will prove well worth while from a purely economic standpoint to take vigorous steps to eradicate this disease and lift the burden of disability which it lays upon the shoulders of our southern population.

**The Conquest of Yellow Fever.**—The discovery of the mode by which malaria is transmitted opened the way for the most dramatic episode in the history of public health—the conquest of yellow fever. This disease has long been the curse of tropical America. From this region of endemic prevalence it spread to the United States in every year between 1800 and 1879 with but two exceptions. In 1793 a tenth of the population of Philadelphia perished from its ravages. When the American Army of Occupation entered Cuba in 1898, yellow fever was one of the major problems with which it was confronted, and the origin of the disease was still a complete mystery. In the words of a report issued by the United States Public Health Service in that year, " one has not to contend with an organism or germ which may be taken into the body

with food or drink, but with an almost inexplicable poison so insidious in its approach and entrance that no trace is left behind."

At this very time, however, the mosquito theory of the transmission of malaria had just been established. When a commission of army surgeons, including Reed, Carroll, Lazear, and Agramonte, was sent to Havana in 1900 they naturally turned to a similar explanation for the causation of yellow fever. What followed has been elsewhere described in the following words:

The lower animals were not known to suffer from yellow fever, so that experiments upon human subjects were essential. In the words of Dr. Kelly's life of Major Reed, "after careful consideration, the Commission reached the conclusion that the results, if positive, would be of sufficient service to humanity to justify the procedure, provided, of course, that each individual subjected to experiment was fully informed of the risks he ran, and gave his free consent. The members of the Commission, however, agreed that it was their duty to run the risk involved themselves, before submitting any one else to it."

The first successful experiment was made with Dr. Carroll, who allowed himself to be bitten on August 27 by a mosquito which had previously bitten four yellow-fever patients. Four days later he was taken sick and for three days his life hung in the balance. Both he and Private W. H. Dean, the second case produced experimentally in the same way, recovered. Dr. Lazear, however, who came down with the disease, not as a result of the experimental inoculations to which he also had submitted, but from an accidental bite, died a week later, after several days of delirium.

An experimental station, named "Camp Lazear" after this first martyred member of the party, was established in the open country; and to the lasting honor of the United States Army, volunteer subjects for the experiments from among the troops were always in excess of the demand. Private John R. Kissinger and John J. Moran, a civilian employee, were the first to volunteer

"solely in the interest of humanity and the cause of science," their only stipulation being that they should receive no pecuniary reward.

The result of the experiments carried out at Camp Lazear proved beyond peradventure that yellow fever was transmitted by the bite of a certain mosquito, *Aedes calopus*,[1] and in no other way.

On the memorial tablet to Lazear in the Johns Hopkins Hospital is the inscription: "With more than the courage of the soldier, he risked and lost his life to show how a fearful pestilence is communicated, and how its ravages may be prevented." The same risk was freely taken by each member of the party from major to private. The result of their devotion is indicated in two of Reed's letters to his wife: "Six months ago, when we landed on this island, absolutely nothing was known concerning the propagation and spread of yellow fever—it was all an unfathomable mystery—but today the curtain has been drawn"; and later, on New Year's Eve: "Only ten minutes more of the old century remain. Here have I been sitting reading that most wonderful book, 'La Roche on Yellow Fever,' written in 1853. Forty-seven years later it has been permitted to me and my assistants to lift the impenetrable veil that has surrounded the causation of this most wonderful, dreadful pest of humanity and to put it on a rational and scientific basis. I thank God that this has been accomplished during the latter days of the old century. May its cure be brought out in the early days of the new."

The practical result of this discovery was immediate and striking. In the half-century or so for which we have records, yellow fever had killed an average of 750 persons a year in the City of Havana. The sanitary reforms introduced by the American Army of Occupation, which produced good results in reducing typhoid and smallpox, had been powerless against yellow fever because its cause was as yet a mystery. Following immediately on the experiments at Camp Lazear, on February 15, 1901, a campaign was begun on the new lines indicated, by screening the rooms occupied by yellow-fever patients and destroying all mosquitoes in the neighborhood. As a result there were six deaths in the City of Havana during the year 1901 as against 305 in the preceding year,

[1] Originally called *Stegomyia fasciata.*

and although sporadic cases have been introduced from other localities, yellow fever has never again established itself in Havana. The scourge of centuries was wiped out in a single year.[1]

The man who was responsible for the initiation and the execution of the actual campaign against the yellow-fever mosquito in Havana was Colonel, later General, W. C. Gorgas. When the United States undertook the tremendous task of constructing the Panama Canal, Gorgas was sent to the Isthmus and placed in charge of the sanitation of the Canal Zone. It was the successful fight which he waged against yellow fever and malaria on the Isthmus, along the lines mapped out at Havana, which enabled the Americans to succeed where the French had failed and made possible the building of the Panama Canal. Today, the International Health Board, following the Gorgas program, is carrying on a systematic campaign against yellow fever throughout the world,—a campaign so successful that the disease persists only in two or three isolated regions of Brazil and of East Africa; its complete eradication may be looked for in the near future.

### Topics for Investigation and Discussion

1. The water supply system of this community.
2. What this community is doing to safeguard its milk.
3. Modern methods for preserving foods.
4. Modern sewage problems and their relations to health
5. The city dump,—its use and abuse.
6. Insects as carriers of disease.
7. The Panama Canal as a monument to sanitation.
8. The heroes of sanitation: Reed and Gorgas.

[1] C.-E. A. Winslow. *The Evolution and Significance of the Modern Public Health Campaign*, New Haven, 1923.

## CHAPTER XV

### THE HEALTH DEPARTMENT AND ITS WORK

**The Sanitary Supervision of the City.**—In olden times, and even today in backward countries and in many rural districts, widespread epidemics of disease have been caused by insanitary conditions of living—by careless disposal of human excrement and by accumulations of filth which help to breed vermin and insect carriers of disease. In modern cities such conditions have been practically eliminated, so that diseases due to bad sanitation, in this obvious sense, are rare. To retain the ground that has been won requires, however, constant supervision; and this supervision remains one of the primary functions of the Board of Health. Inspectors are therefore employed to keep constant watch over the state of streets and yards and dwellings to see that no conditions are maintained likely to be offensive or injurious to health and to investigate any complaints which are made in regard to alleged nuisances. Many of these "nuisances" have no real health significance but are merely objectionable from the standpoint of sight or smell; but those which involve improper handling of human excrement, or fly or mosquito breeding, or rat propagation—since rats may carry the germs of bubonic plague—are of vital moment.

It is also essential that the Board of Health should maintain constant supervision over the conditions under which foodstuffs are produced and handled, should inspect dairy farms and pasteurizing plants and creameries, slaughter houses, food stores, restaurants, and the like, to make sure that cleanly conditions are maintained and that the foods to be sold are not infected or otherwise dangerous to the public health.

**Administrative Control of Communicable Disease.**—A second fundamental activity of the Board of Health is concerned with the control of communicable diseases by isolation, quarantine, and the use of sera and vaccines. The law in many states requires that communicable diseases, and diseases which from their general nature may be presumed to belong to the communicable group, shall be reported to the Board of Health, not only by physicians but also by school teachers and principals and public health nurses. It is the duty of the health authorities to provide laboratory service for the prompt diagnosis of disease and the detection of carriers by bacteriological methods and to see that the actual case of disease is properly isolated, and all discharges disinfected, and that "contacts" are kept under observation and excluded from school and places of public assembly until the incubation period is over and it is certain whether they have been really infected or not.

The most important part of the work of the Board of Health in connection with communicable disease is, perhaps, the provision of the sera and vaccines which are of such great value in the treatment and prevention of various diseases of this class. The

Board should do everything in its power to promote the widest use of the vaccines which protect against smallpox and typhoid fever and of the toxin-antitoxin which makes children immune against diphtheria; while even in the case of measles, scarlet fever, and certain forms of pneumonia valuable sera are now available in the larger cities. The teacher can do much to aid in the more general use of these beneficent safeguards by making clear to the school children the scientific bases upon which their use is founded, as discussed in a previous chapter.

**The New Public Health.**—The sanitary supervision of the city and the control of acute communicable diseases formed in the past the chief activities of the Board of Health. During the present century, however, with the gradual control of the great epidemics once caused by grossly insanitary conditions, the public health campaign has been greatly expanded so as to visualize new objectives. The present ideal of the progressive health officer is the prevention of disease and premature death of every kind, whether the disease belongs to the communicable group or not. As a result the movement has taken on an entirely new spirit.

It is obvious that the major health problems of the present day are no longer plague and cholera, or even typhoid fever and diphtheria. The chief disabling and killing diseases in most civilized countries are infant mortality, tuberculosis, pneumonia, heart disease, nephritis, diabetes, and cancer. Most of these diseases must be attacked by methods quite different from those used in the past. They cannot be controlled by direct

legislation or the exercise of the police power of the state but by a campaign of general popular education aimed at the cultivation of habits of personal hygiene. The reduction of infant mortality, for example, can be accomplished only by teaching mothers how to care for their babies properly; the control of tuberculosis, by inculcating the importance of fresh air and rest; the postponement of degenerative diseases of the heart, arteries, and kidneys, by the development of general habits of hygienic living. The modern public health movement has therefore become more and more an educational one, in which the teacher must play a fundamental rôle in preparing the ground for the later detailed instruction of the health authorities, by laying a sound basis of hygienic knowledge.

The new ideal of public health, however, involves more than a campaign of popular education in regard to the general principles of healthy living. It requires the bringing to each individual of the particular advice he or she needs, to get the best results from his or her particular living machine. This means personal counsel based on medical examination and involves a new relation between the physician and the patient. If the resources of medical science are to be most effective they must be applied in the early stages of incipient disease rather than later on, when the patient realizes that he has become acutely ill. For this purpose the health authorities and the voluntary health agencies of the country are constantly developing new agencies, such as infant welfare stations, tuberculosis dispensaries, heart clinics, cancer clinics, and the like, for the recognition of the early stages of disease and for the

teaching of the health habits, or the provision of the medical treatment, necessary to prevent their further development.

**The Campaign against Infant Mortality.**—The organized movement for the reduction of infant mortality is an excellent example of the general tendencies of modern public health. In certain countries, even today, one child out of every four dies before it reaches its first birthday. In the United States we have reduced this figure to less than one in ten; while in New Zealand it is below one in twenty. The deaths of infants are generally due to preventable causes and can be controlled by proper hygienic habits of the mother during the prenatal period and by proper care of the child after it is born. The more progressive cities have, therefore, developed prenatal clinics where the pregnant woman can come for medical supervision and advice. We find everywhere infant welfare stations or baby clinics where the infants should be brought to be weighed and examined by the doctor and where the mothers are taught how the baby should be fed and clothed and aired and bathed. One of the most important factors in infant health is of course feeding. The greatest emphasis is therefore laid on breast feeding, which is the only really satisfactory method of providing nutrition for the young infant. When breast feeding is impossible, the mother should be taught how to modify and pasteurize cow's milk so as to make it a reasonably satisfactory substitute. The clothing of the baby and the airing of its room so as to avoid undue chill on the one hand and the debilitating effect of overheating on the other; the bathing of the baby; the

arrangement of its hours and conditions of sleep; and its protection from communicable disease are all points of major importance in connection with infant hygiene.

In New York City the development of infant welfare work along these lines reduced the death rate of babies under one year of age from 144 deaths for every 1000 births in 1907 to 94 deaths for every 1000 births in 1914, which meant a saving of over 5000 infants' lives a year.

Since the care of infants so often devolves upon their elder sisters it is important that girls should have an early opportunity to learn about the essentials of infant care. To meet this need Little Mothers' Leagues have been organized in the schools of many cities. By means of talks and demonstrations given by the school physician, school nurse, or teacher, the members of these leagues are taught the essentials of baby welfare. The girls have their own organization and elect their own officers. Each one agrees "to do some one thing each day to help a baby." Teachers who desire to play a part in the development of this movement in the schools can easily obtain detailed information in regard to the essentials of child care by writing to the United States Children's Bureau, Washington, D.C., or to their state and city departments of health.

**Tuberculosis.**—A second major objective of the modern public health campaign, which is sufficiently important to demand special consideration, is the control of tuberculosis. This disease is, of course, a communicable one. It is important to limit the direct spread of infection by pasteurizing milk—which may contain the germs of bovine tuberculosis—and by

teaching consumptives to care for their sputum and mouth spray so that they shall not prove a source of danger to others.

Protection against new infection is, however, only a small part of the general campaign against tuberculosis. The germ of this disease is unfortunately so common that almost every individual, sooner or later, is slightly infected with it; yet this does not mean that everyone has tuberculosis, in the sense of suffering from actual disease. The human body has a considerable power of defending itself against this invader, and a few germs entering the healthy body are quickly overcome. It is when a great many germs are taken in, and particularly when the strength is reduced by attacks of other diseases, or when resistance is lowered by intemperate habits, by living and working in overheated rooms, by eating insufficient food, or by breathing particles of silica dust, that the invisible enemy overcomes the defenses of the body. The most important factor in the control of tuberculosis is, therefore, the building up, through hygienic habits, of a vital resistance sufficient to prevent, or to check, the development of the disease.

The first essential in combating tuberculosis is the detection of the disease in its early stages, since incipient tuberculosis is almost always curable, while in the far-advanced stage recovery may be hopeless. It is important, therefore, that the public should be made very familiar with those physical signs which are likely to indicate the onset of this disease—a cough which hangs on for a long time, a run-down and tired feeling, feverishness in the afternoon. Anyone who has any of

these symptoms should promptly consult a physician or visit the nearest tuberculosis dispensary so that, if the subtle enemy is at work, its presence may be detected in time.

The ordinary "Consumption Cures" are frauds which waste the money of their victims and do immeasurable harm by the loss of precious time. The cure for tuberculosis is hygienic living under the advice of a competent physician—properly directed rest and exercise, plenty of fresh air, and a sufficient amount of wholesome food. If such treatment is taken at a sufficiently early stage in the disease, tuberculosis can generally be cured.

The cure does not depend on any special climate, as was once thought to be the case. With proper treatment, people get well in all parts of the United States, and the strain and expense of a long journey are usually unnecessary. Treatment can be carried out best, however, in a sanatorium or hospital established especially for the cure of tuberculosis. In such a hospital, where there is constant medical supervision and nursing care, the patient stands a far better chance of recovery than anywhere else. The treatment of the patient in a hospital also ensures the protection of family and friends, who might be in danger of infection if the patient were not properly cared for in the home. Where, for any reason, hospital treatment is impossible, the cure can often, however, be taken at home, if the advice of the physician is carefully followed.

It should be remembered that while hygienic treatment will generally lead to recovery, if begun at a sufficiently early state, the patient who has recovered

from tuberculosis is always liable to a relapse if resistance is weakened by undue fatigue or any other strain upon the vital powers of the body. Observance of the laws of hygiene is, therefore, of particular importance for those who have ever suffered from this disease. That hygiene is a most effective agent in combating it is very clearly indicated by the fact that improvement in living conditions, with the development of dispensary, sanatorium, and nursing service, have reduced the death rate from tuberculosis to less than one-half of what it was half a century ago.

The National Tuberculosis Association, a great voluntary organization which has played a leading part in the successful campaign against this disease, has organized throughout the schools of the country an admirable movement for enlisting every child in the good cause of healthy living. This movement, called The Modern Health Crusade, may be joined by any child who agrees to follow certain health rules.[1] Every day at bedtime his father or mother checks off on a special record card each of these health "chores" which the child has performed that day. To be a modern Health Crusader the child must do at least forty of these chores a week and promotion to higher grades

[1] 1. I washed my hands before each meal today. 2. I drank a glass of water before each meal and before going to bed today. 3. I brushed my teeth in the morning and in the evening today. 4. I took ten or more slow deep breaths of fresh air today. 5. I played outdoors or with windows open more than thirty minutes today. 6. I was in bed ten hours or more last night and kept my window open. 7. I tried today to sit up and stand up straight, to eat slowly, and to attend to toilet and EACH need of my body at its regular time. 8. I took a full bath on each day of the week that is checked (X).

of rank follows on better and better achievement.[1]

**The Public Health Nurse.**—With the realization that the primary problem of the modern health campaign was popular education and that this education must be made specific and definite in its application to the individual, the public health nurse has come to be a figure of constantly increasing importance in this field. The infant welfare nurse aids the physician at the infant welfare station, explains to the mother how the milk should be prepared, and visits her in the home to apply the principles of infant hygiene under the actual conditions of a particular tenement dwelling. The school nurse carries out those phases of health inspection which are assigned her, persuades the parents of the necessity for treatment of the defects discovered, and makes arrangements with the physician or at the proper clinics so that the treatment shall be actually provided. The tuberculosis nurse helps to find the early case in the home, persuades persons who have suspicious symptoms to come to the dispensary for diagnosis, supervises the care of patients in the home, persuades those who ought to go to a sanatorium to do so, and takes steps to secure their admission.

Frequently these special types of public health nursing and others, such as mental hygiene work or communicable disease work, are carried on by nurses who are limited to purely educational activities along the particular line in question. There is a growing conviction, however, that the ideal type of public health

[1] Literature may be obtained from the National Tuberculosis Association, 370 Seventh Avenue, New York City.

nursing is that in which a single nurse works in a particular district on a generalized plan. She cares for the sick on what is known as the "hourly" basis, does infant welfare nursing, tuberculosis nursing, and school nursing as well, combining health education with the beneficent activities of district service. Her presence in all the crises which may arise bring her into personal and intimate contact with the family, and the fact that she is the one to provide direct aid and assistance in time of need gives her health teaching a weight which it could not gain in any other way.

**State and Local Health Organizations.**—The most important of all health promoting agencies is the local health department of city, town, or county, which carries on most of the actual work of sanitary supervision, isolation of communicable disease, health education, and the supply of various kinds of clinic service for the diagnosis and preventive treatment of disease. A considerable part of the work, however, under existing conditions in the United States, is done by voluntary agencies, such as public health nursing organizations, infant welfare societies, anti-tuberculosis associations, and the like. The teacher should familiarize herself with all the public and private organizations working in the health field. She can obtain from them literature which will prove of much assistance in her classroom work.

The state board of health stands over all these local health forces in an advisory and supervisory capacity, stimulating and standardizing their activities and giving them aid in special emergencies. It supplies laboratory facilities for the smaller communities and

has direct charge of water and sewage problems which generally involve inter-town relationships. The state board will also supply the teacher with literature.

**Federal Health Activities.**—The United States Public Health Service, as it functions today, is the growth of one hundred and twenty-five years of experience and legislation. Congress in 1798 established this Service as the Marine Hospital Service for the care of sick and disabled merchant seamen. This Hospital Service was placed under the control of the Treasury Department, and through all subsequent changes in name and function Public Health has remained under its supervision. By 1912 the Service had taken on its present organization as the United States Public Health Service and had extended its activities to embrace the protection of the United States from the introduction of disease from without, the medical examination and inspection of all incoming aliens, the prevention of interstate spread of disease, coöperation with state and local health departments in all public health matters, investigation of the diseases of man, the supervision and control of biologic products, public health education and dissemination of health information, as well as the maintenance of marine hospitals and relief stations for the care of special beneficiaries as prescribed by law.

The Internal Revenue and the Customs Service, branches of the Treasury Department, also do valuable health work in enforcing anti-narcotic and prohibition laws, meat inspection, and the Pure Food and Drug Acts. The Treasury Department is not the only government department that concerns itself with health

problems. The Interior Department, acting through its Bureau of Mines and Indian Affairs, supervises the safety, accident prevention, and health of miners and Indians. The Geological Survey of the Interior Department makes investigations of surface streams and sources of ground water supplies and so is interested in water and its relation to health; while the Bureau of Education has divisions of School Hygiene and Physical Education, besides caring for the health of the natives of Alaska. The War and Navy Departments watch over the health of the United States soldiers and sailors, but the health of Federal prisoners is looked after by the Department of Justice through its Superintendent of Prisons. The departments of Commerce, Agriculture, and the Post Office each have special bureaus or officials charged with the protection and supervision of the health of the nation or of its special employees.

As independent parts of governmental machinery for the safeguarding of health may be mentioned such bodies as the Federal Board of Vocational Education, the United States Employees' Compensation Commission, and the Bureau of Safety, of the Interstate Commerce Commission.

**International Health Activities.**—In 1863 the International Committee of the Red Cross began work in Geneva, Switzerland, for the relief of suffering caused by war, pestilence, and famine. In 1893 the Pan-American Medical Congress met in Washington, D.C., to study the prevention of epidemics, particularly yellow fever in the western countries. The *Office International d'Hygiène Publique*, in 1907, was author-

ized under the Convention of Rome to consider any question of international health. The Epidemic Commission of the League of Nations, working with the Polish National Health Service, began fighting typhus fever in Poland in 1920. Poland's energy and efficiency in rebuilding her Public Health Service has now the admiration of the world. Her success in stamping out this epidemic is a noble example of what organized health work can do. Wider and more definite development on international lines of the common task of combating preventable disease was made possible in 1921 by the organization of the Health Section of the League of Nations, whose splendid achievements have been discussed in a previous chapter.

**Achievements of the Public Health Campaign.**—The success of public health work in any community is measured by its vital statistics, or the records of deaths and cases of disease, from various causes and at various ages, compared with the population. It must be remembered, however, that the death rate of a community will be greatly affected by its racial and social makeup, so that a given rate in one city where such conditions are unfavorable may indicate better public health work than a lower rate in a more favored community. The general death rate is the ratio of the total number of deaths from all causes in a year to the number of people in the city, town, or state, reduced to a basis of 1000. For instance, if in a city of 10,000 people there are 150 deaths in a given year, the general death rate would be 15 per 1000.

The death rate in New York City fell from 26 in 1888 to 14 in 1913, or, in other words, was decreased

by 46 per cent in twenty-five years. There were in 1913 about 200 deaths every twenty-four hours in New York City. If the death rate of twenty-five years before had continued there would have been 370.

For the United States as a whole, in the case of four of the chief communicable diseases—tuberculosis, diphtheria, typhoid fever, and diarrhea, there has been effected a reduction of over 50 per cent in the death rate during a period of two decades. The decrease of more than 2 per 1000 in the rate for this group of diseases means that every year two lives are saved for every thousand persons in the population, or a saving of 200,000 lives in the United States each year.

Dr. Louis I. Dublin has recently pointed out that in the state of Massachusetts—for which the longest series of records are available—the average age at which men die has increased from less than 40 years in 1855 to more than 55 years in 1920, an addition of fifteen years to the span of human life. Dr. Dublin estimates that by the application of well-proven methods the average age of our American population could be increased to nearly 65 years, adding ten years more to the figure now attained.

### Topics for Investigation and Discussion

1. The Board of Health and its functions.
2. Education as a factor in public health.
3. What this community is doing to fight tuberculosis.
4. Economic and social justification for the public health nurse.
5. The relationships between local and Federal health organizations.
6. The international importance of public health.

## CHAPTER XVI

### SEX HYGIENE

**The Need for Instruction in the Hygiene of Sex.**—One of the most important biological functions of the living body, whether plant or animal, is that of reproduction, or the continuance of the race. It is obvious, therefore, that the physiology and hygiene of reproduction is an essential part of the general subject of physiology and hygiene as a whole. As a matter of fact it is even more vital that the child should know something of the physiology of reproduction than it is that he should understand the physiology of muscular movement, because the problem is a more complex one and because it is a problem which is affected to a much greater degree by the imagination and the will.

Yet, as everyone is aware, the ignorance of children and young people in regard to the phenomena of reproduction is appallingly great on account of the mistaken social taboos placed upon the whole subject in the past. Furthermore it is not merely the absence of knowledge which we have to fear; it is the presence of distorted and vicious misinformation. If parents and teachers tell a child nothing about its bones and muscles, it will know nothing about its bones and muscles. If, however, parents and teachers tell a child nothing about reproduction it will quite certainly

obtain from other sources impressions in regard to the problem of sex which are almost always erroneous and often dangerous. The studies made by Dr. M. J. Exner of the American Social Hygiene Association have indicated that a large majority of boys receive their first permanent impressions about sex from ignorant nurses, the gossip of companions, advertisements, personal adventures, or other undesirable sources before the age of twelve and that the ideas thus received have often led to some form of sexual practice between the ages of twelve and fifteen. Teaching of the facts of sex, according to this study has, in the past, been generally four to six years too late.

The ideal source of counsel in regard to sex and sex hygiene is of course the parent, and one of the most fundamental duties of parenthood is to see that this type of counsel is provided. Unfortunately, however, the parents of the present generation are themselves generally lacking in the clear knowledge or the frank and unembarrassed approach to sex questions, necessary for successful sex teaching. It is a condition, not a theory, which confronts us. If the children of today are not given a right attitude toward sex in the schools they will not gain such an attitude at all, in many instances.

**Avenues of Approach to Sex Instruction.**—In emphasizing the fact that the school has a very substantial responsibility in regard to sex hygiene, the peculiar difficulties in the way must not be overlooked. Attempts to deal with this problem by the wrong person or in the wrong way may easily do more harm than good. Lack of clear and accurate knowledge of the

facts in the case and poor methods of pedagogy will be as harmful in this field as in others; but in connection with sex teaching it is also vitally important that the teacher's whole attitude should be wholesome, sane, balanced, and constructive. Pessimism, based on some unfortunate personal experience, abnormal emotional interest in sex problems, leading either to repression or to over-emphasis, or the slightest flippancy in the treatment of the subject will be fatal to good sex teaching.

The devotion of definite periods of study to the specific consideration of sex hygiene as an individual topic is rarely wise or necessary. The following is quoted from a pamphlet on this subject prepared by the United States Public Health Service:

> In planning to include sex education in the school curriculum it should be realized that sex in life is not isolated as an experience or as a group of facts. It winds through many kinds of experiences at different ages and is a part of many kinds of facts. Few branches of knowledge or feeling do not touch sex problems. Few subjects can be taught properly with the sex aspects left out. An examination of the curriculum shows that society has had an official censor deleting sex from all classroom work under the orders of a now outworn prudery. We find sex left out of all subjects no matter how much the omission weakens or even falsifies them. * * * To introduce sex instruction, then, is not to add subjects but merely to lift the taboo from certain kinds of knowledge which form organic parts of courses in nature study, physical education, biology, physiology, and community civics or sociology. Sex knowledge is by this means given its normal place and can often be conveyed to pupils in their classes without the slightest consciousness on their part that what they are receiving is sex information.

In considering sex education from this standpoint

there are three distinct types of instruction which may profitably be considered: First, such basic instruction in the general principles of reproduction as should be given to all children in the grammar grades in the course of the teaching of nature study and other subjects; second, more specific teaching in regard to the anatomy and physiology and hygiene of the human sex organs which may be given by specially qualified teachers in the high school grades; and third, personal counsel, given to individual boys and girls at all stages in their development, particularly in connection with courses in physical education and the supervision of athletic and social activities.

**General Biological Backgrounds.**—In the grades it is important in connection with courses in nature study or hygiene to bring out the fact that a life cycle, or circle, is a fundamental phenomenon of all living matter. The simplest living things, undifferentiated single cells such as the bacteria, merely reproduce by increasing in size and then splitting into two. Even here, however, recent studies indicate that the cell just formed by such a splitting differs in its physiological properties from the older cell which is ready to subdivide again. Among the higher organisms, made up of great numbers of differentiated cells, there is a more definite cycle of youth, maturity, and old age culminating in death. Before death occurs, however, in the normal course of things, certain cells are detached from the parent which form the starting point for a new generation; and it is in these germ cells that the particular characteristics of the individual are handed on to succeeding generations by the processes of heredity.

In fairly simple plants like the molds the germ cells, or spores, are all alike. In the higher plants and animals, on the other hand, there are two kinds of germ cells, which we call male and female, and these two sorts of cells must fuse together to form the ovum, or egg, from which the new individual develops. In many plants, and in some animals, both male and female germ cells are produced by the same parent, but in still more complex types the parents are themselves differentiated as male and female, each plant producing its own kind of germ. The study of flowers and their fertilization forms an excellent introduction to the subject. To quote from another Public Health Service Bulletin:

In many forms of plant life the flower contains the reproductive organs. In its center is a single central organ called the pistil. Around it are several stems, called stamens, on the top of which is the yellow dust, or pollen. At the base of the pistil is a receptacle, called the ovary, in which are very small particles, called germ cells or ova. Cells of a different kind develop from the pollen. The ova may be called the female cells, and the cells which develop from the pollen the male cells. When the flower is in full bloom it is ready to do its part in reproducing the plant. As bees fly about from one plant to another they carry pollen from flower to flower. Part of this pollen is brushed off on the tops of the pistils. Germ cells from the pollen go down through the pistil into the ovary, where they fertilize the ova; that is, they make the ova capable of growing. After the ova are fertilized, they slowly develop into seeds. The upper part of the flower dies and drops away. The ovary becomes a seed pod, in which several fully matured seeds can be found. These may be kept through the winter. When planted in the spring they produce other plants like the one from which they came.

Next, one may pass easily to a consideration of

fertilization among such animal forms as the fishes, in which the process takes place outside the body. Examples may be chosen, even at this relatively low point in the scale of life, which introduce the ethical ideals of responsibility for racial continuity and the sacredness of parenthood. To quote again:

> The salmon of the Pacific Ocean furnish interesting examples of reproduction in animal life. In the spring they swim in to the rivers and find shallow, sheltered places for nests. There the female lays a quantity of eggs. She then swims away and the male comes to the nest and deposits from his body a quantity of fertilizing fluid, containing cells called sperms. Thus they work back and forth until the female has laid several thousands of eggs. Many are fertilized by the sperms and develop into young fish. The parent fish, however, are exhausted by the process of reproduction. They drift down the stream in a helpless condition and very few ever reach the ocean alive. They give up their lives in producing their young.

Finally with care and discretion, the principles thus established may be brought into connection with the higher forms of life by allusion to the facts of animal breeding, which become familiar without prudish suggestiveness to the child brought up on a farm, but which must often be interpreted to the city child, if the whole concept of sex is to be faced, not as a sinister secret but as a simple and natural and honorable part of human experience.

**Specific Teaching of the Anatomy and Physiology of Human Reproduction.**—It is in general only in the high school grades and in separate classes of boys and girls and by specially qualified teachers that group instruction can be carried on in regard to the details

of human reproduction. Where the teacher has the right mental attitude toward the subject, such teaching may be very useful as a part of a high school course in physiology. The detailed information in regard to the anatomy and physiology and hygiene of the reproductive system can be obtained in pamphlet form from almost any State Board of Health or from the United States Public Health Service in Washington. Certain of the more important facts are well stated by Howell as follows:

> In the human female the reproductive life extends from puberty, at about the fifteenth year of age, to the menopause or change of life which is reached, as a rule, about the forty-fifth year. During this period an ovum is released from one or the other of the ovaries once every twenty-eight days. It is believed now that this act of ovulation, as it is called, occurs at about the middle of the menstrual period, that is, midway between two menstruations. The liberated ovum passes into one of the Fallopian tubes of the uterus and makes its way slowly down the tube toward the uterus. The passage takes perhaps three or four days. If sexual union has occurred about this time the spermatozoa, owing to their motility, make their way along the interior of the uterus and into the tubes. If they meet with the ovum one of them unites with it and the act of fertilization is accomplished. If this does not occur the ovum degenerates soon after passing into the uterus. If the ovum is fertilized, then after reaching the uterus it becomes attached to or implanted in the mucous membrane and undergoes rapid growth. Where it is attached to the mucous membrane there is developed a special organ, the placenta, through which the growing embryo is nourished from the maternal blood. During this period of growth no further ovulation occurs, and after nine months the child comes to term, and changes occur which are not well understood, but which lead to contractions of the uterus and the birth of the child.[1]

[1] W. H. Howell. *The Human Machine.* National Health Council Health Series.

In the grammar grades, specific applications to human sex hygiene must generally be made in contact with the individual child, often perhaps by the teacher of physical education or by the teacher or nurse or physician in connection with routine physical examinations.

**Sex Hygiene Problems of Childhood.**—One of the particular values of education in sex hygiene, such as can be given by the wise parent or teacher in individual conference, is the realization that the physiology of sex is a part of general physiology and that the organs of reproduction react upon and are in turn affected by all the other organs of the body. Physiology is today coming to attach more and more importance to the effect produced by the chemical secretions of one organ in stimulating other organs to activity. Such internal secretions are called hormones, and certain glands of the body have no other purpose than the production of hormones. The sex glands, in addition to their primary function of forming eggs or sperm, secrete hormones which have a far-reaching influence on development and growth. Thus a cock in which the sex cells have been destroyed fails to develop the comb and other characteristics of the normal male; and thus the gelding, a male colt whose sex glands have been removed, is markedly inferior in strength and vigor to the normal stallion.

Such facts as these make it clear that the hygiene of the reproductive organs is of vital importance to the body as a whole and that the boy who wishes to develop a strong, normal body should scrupulously avoid anything which injures or overexcites

the sex organs such as so-called "self-abuse." The reverse influence—the influence of the other organs upon the sex organs—is emphasized by the fact that abnormal sex tendencies of all kinds can best be combated by physical exercise, fresh air, good food, and normal mental and social life.

However, it is of the very first importance to allay undue fears based on lack of knowledge of the sexual life. The evil effects of even self-abuse have been grossly exaggerated. Seminal emissions and occasional erotic dreams are entirely normal phenomena in boys and their nature as incidents of approaching maturity should be understood. In the same way girls should be taught to understand the meaning of the phenomena of menstruation.

**Venereal Diseases.**—On the other hand it is most desirable that children approaching the age of puberty should receive from some source adequate warning of the grave dangers of gonorrhea and syphilis. The extent of the problem is indicated by the fact that the examinations of drafted men for the United States Army in 1917 and 1918 showed about 1 per cent actively infected with syphilis and 4 per cent with gonorrhea at the moment of examination. Surgeon-General Gorgas declared that venereal disease constituted a greater burden upon the effectiveness of the Army than all the wounds occurring in battle; and in civilian life it is certain that through their gradual and far-reaching influence upon heart, arteries, brain, and other organs these diseases are among the greatest of all factors in the death rate of ordinary civilian life, exceeding even tuberculosis.

There are three major facts to be borne in mind in regard to the venereal diseases. In the first place, both gonorrhea and syphilis are communicable diseases due to particular micro-organisms, sometimes contracted by the use of infected drinking utensils, towels, or similar objects, but generally through sexual contact. The complete elimination of irregular sex relations is therefore the only sure way to control venereal disease.

In the second place, if venereal disease is contracted it can generally be cured by prompt and competent medical treatment. Terrible harm is done in this connection by the army of quacks who batten on the victims, or sometimes merely supposed victims, of venereal disease. There are now in all cities of any size in the United States clinics operated by state or county or city authorities where such diseases can be treated free of charge.

Finally, it cannot be too strongly emphasized that no man who has contracted venereal disease can marry, without committing an act of criminal recklessness, until pronounced completely cured by competent medical authority.

**Standards of Sexual Morality.**—The real keystone of the campaign against venereal disease is the development throughout the community of higher standards in regard to sexual morality than have generally obtained in the past. The old view that sex activity was necessary to physical or mental vitality has been completely discredited. In the World War the authorities of the Army and Navy of the United States, for the first time in the history of military establishments,

came out squarely and forcibly for continence and in every possible way emphasized the duty of the young man in this respect to himself, to his country, and to his future wife. On account of the relative strength of physiological instinct in the two sexes, it is generally more difficult for the boy than for the girl to live up to the single standard of morals; but it is nevertheless the duty of every boy and man to conform to this standard, in common fairness and justice to the life partner he hopes to win, or has already won.

**Broader Aspects of Race Hygiene.**—It is essential, however, to bear in mind that the avoidance of venereal disease is by no means the sole or even the chief problem in sex hygiene. The whole question should be viewed as one which involves a primary responsibilty, toward society, the responsibility of transmitting to future generations an inheritance of strength and power. It involves not only the avoidance of communicable disease but the preservation of a maximum of individual vitality and it involves, too, the cultivation of a sense of grave responsibility in regard to the possible effects of perpetuating in future generations serious hereditary defects of body or mind, present in one or the other prospective parent.

It has been well said that " Each youth who grows up and marries becomes a link in a great chain of human beings. This chain reaches back into the past for thousands of years, and it may reach forward into the future for an even longer time. One false step may infect the racial stock and blight the lives of generations to come. If the young man keeps his body in good condition and lives a clean life, his

descendents will in all probability be vigorous and useful citizens. The spark of life is to be accepted as a sacred trust to be transmitted undimmed to future generations."

### Topics for Investigation and Discussion

1. The place of sex hygiene in the curriculum.
2. Biology as the background for sex instruction.
3. Standards of sexual morality.
4. The social responsibilities of parenthood.

# CHAPTER XVII

## ACCIDENTS AND FIRST AID

**Safety First.**—One of the most notable tendencies of the present day is the growing recognition of the great importance of accidents of various kinds as factors in disability and premature death, and of the fact that such accidents are in large measure preventable. Systematic campaigns have been organized for the prevention of fire losses, street accidents, and factory accidents, so that " Safety First " has become a nation-wide slogan. It is no longer sufficient to excuse an act of carelessness by saying, "It was only an accident."

It is estimated that nearly 80,000 deaths and 2,000,000 serious injuries result from accidental causes in the United States each year. It is particularly disconcerting to note that the death rate from railroad accidents is four times as high in this country as in England, and the rate from automobile accidents, two and a half times as high. In many states and cities the law now requires that specific instruction shall be given to school children in regard to the prevention and care of accidental injuries. Whether such a provision be in force or not, it is most desirable that this important topic should find its place in the course on hygiene.

**Street Accidents.**—Among the most numerous and serious of accidents are those due to the hazards of

street traffic. These accidents deserve particular attention in the school because so large a proportion of the victims are children. Automobile accidents form the largest single factor in the accident rate, causing 30 to 40 deaths a day on the average in the United States, giving a death rate higher than that for typhoid fever or scarlet fever. While 25 per cent of fatal accidents as a whole occur among children under 15 years of age, the proportion rises to 35 per cent for automobile accidents. The table below well indicates how street accidents occur and suggests the points which should be emphasized in dealing with this subject.

Deaths and Injuries from Street Accidents

Occurring among Children between 6 and 16 Years of Age for a Period of 9 Months, New York City [1]

| | KILLED | INJURED |
|---|---|---|
| Crossing streets not at crossing | 184 | 3,583 |
| Playing games in roadway | 56 | 1,865 |
| Crossing streets at crossing | 40 | 1,274 |
| Running off sidewalk into street | 31 | 677 |
| Collisions of vehicles | 3 | 622 |
| Careless bicycle riding | 10 | 522 |
| Stealing rides on vehicles | 19 | 431 |
| Climbing trees, poles, fences, etc. | 66 | 227 |
| Roller skating, coasting, etc., in roadway | 11 | 207 |
| Jumping on or off cars, etc., in motion | 1 | 147 |
| Falling over obstacles or into excavations | 1 | 145 |
| Other causes | 328 | 11,084 |
| Total | 750 | 20,784 |

[1] From *Report of the Joint Committee on Health Education,* 1924.

Very definite and tangible results have been attained in the control of the street accident hazard by systematic safety instruction. Thus in St. Louis, where pioneer work has been done along this line, an average of 50 "accidental" deaths a year among children between 6 and 16 years of age was cut down to less than 20. Among the points to be particularly emphasized in discussing street safety in the classroom are these:

Keep to the right in walking and in entering doorways.

Use the cross walks at the intersection of the streets instead of crossing crowded city streets in the middle of the block or diagonally.

Avoid running across the street in front of a car, wagon, automobile, or motorcycle, or just behind a vehicle (which may hide something coming in the opposite direction).

Play in playgrounds or open lots where play is safe, rather than in the street where cars, automobiles, motorcycles, and wagons must run.

Remember that stealing rides on cars, wagons, or automobiles, skating on roller skates in the street, and "hitching" on wagons with roller skates are very common causes of accidents.

Coast in an open field, not across a much-traveled highway or across car tracks.

When waiting for a car, stand on the curb, not in the street.

When you get off a car, wait until it has stopped and always face toward the front. Get *on* with the right hand and the left foot, get *off* with the left hand and the right foot.

Avoid standing on the crowded step of a car, so that a sudden jerk or jolt may knock you off; and remember that putting the head or arm out of the open window of a car causes many accidents from collision with posts or passing vehicles.

Watch for teams and automobiles when you get off a car. Look both ways.

Place banana peels or other waste materials in the waste boxes provided instead of throwing them into the street for others to slip on or trip over.

Keep away from excavations and open manholes.

It is also desirable in view of the danger from live wires to point out that kites should not be flown near wires or strings or wires thrown over trolley lines or other lines carrying an electric current, and to emphasize that one should keep away from broken wires hanging from poles or trees and report them at once to the police. The danger in walking or playing about railroad tracks and yards, or crossing railroad tracks except at the proper places and with due caution, should also be made clear.

**Accidents in the Home and at Play.**—In connection with safety instruction there should also be found time for discussion of other types of accidents, in which children are likely to play a part. Care in the handling of sharp objects, knives, scissors, needles, pins, etc., and in keeping such objects out of the reach of younger children; care in avoiding the danger of falls due to objects left on stairs or to disarranged rugs and carpets; care in removing broken glass, projecting nails, or rusty wires from places where they may do damage; care in the handling of matches, or of combustible materials, the

placing of paper, cotton or other inflammable materials away from lights; care in the handling of kerosene, gasoline, and similar substances so as to avoid fires; caution in the use of firearms; caution in boats or canoes or on the banks of streams or lakes; all these are points which may well be dwelt upon in connection with this topic.

**Instruction in First Aid.**—In addition to the teaching in regard to prevention of accidents, the course in hygiene should also include elementary instruction in the principles of the first aid which should be given when an accident does occur. The two things to remember when some one is badly hurt are to keep cool and to send for the doctor. Often, however, before the doctor arrives, there are simple measures that may be taken to lessen the pain and perhaps to prevent serious harm. Some of these simple first aids everyone should know, so as to be able to do the right thing when the need arises. In bad accidents, prompt action of this kind may sometimes save a life.

The American Red Cross has done splendid service in recent years in developing classes of instruction in this subject. Every teacher should have the Red Cross Textbook on First Aid on her desk for use in emergencies and to serve as a basis for the teaching of the more detailed procedures. An emergency, or First Aid, cabinet should be in every schoolroom. Any carpenter can make a corner cupboard; and a padlock and key is its first requisite. This cabinet should be a unit by itself, with every article in it plainly marked not only with the name, but also with its uses. It

should contain the following: 1 bottle iodine, plainly marked "poison" (in using iodine one coating is sufficient); 1 gauze bandage, 1 inch; 2 gauze bandages, 2 inches; 1 package absorbent cotton; 1 package surgical gauze for pads and compresses; 1 bottle antiseptic soap (for washing hands); 1 package pure bicarbonate of soda; 1 can boric acid ointment (for burns and scalds, apply solution of soda first, then ointment); 1 package adhesive tape; 1 card of safety pins; 1 pair scissors.

**Foreign Bodies in the Eye.**—One of the commonest of the lesser accidents is getting a sharp bit of dust or cinder into the eye. When this happens, the eye should not be rubbed, for rubbing only makes matters worse. If the particle can be seen on the eyeball, it may be removed with the corner of a clean, soft handkerchief. A speck on the lower lid often becomes visible, so that it may be removed, if the lid is pulled down with the finger. Sometimes, if the eye is kept closed for a few minutes, the tears, which flow whenever the eye is hurt, will wash the speck out where it may be seen and removed. Blowing the nose may also help. Sometimes a particle on the upper lid may be removed by taking hold of the lashes of the upper lid, and pulling it down over the edge of the lower lid two or three times, while the patient looks downward. If this does not dislodge the speck, it must be looked for on the upper lid by taking hold of the eyelashes and folding the eyelid back over some small object, such as the small end of a penholder. The speck may then often be seen clinging to the under side of the lid. If the object cannot be removed in this way, a doctor should be

consulted, for a sharp particle may in time work in and do serious harm.

**The Care of Cuts and Wounds.**—The two essential points in the care of cuts and wounds are: First, in serious injuries to stop the flow of blood; and, second, in all cases, to take steps to prevent bacterial infection. If the blood comes from a wound in jets or spurts, an artery is bleeding, and the result may be serious if the flow is not checked. Fortunately, at most parts of the body the arteries are deeply buried in the flesh. A severed artery calls for prompt action. Put firm pressure close to the bleeding part, between the wound and the heart. In case the wound is in the arm or the leg, the pressure is best applied by tying a knot in the center of a folded handkerchief, and laying this knot over the artery. Tie it loosely around the limb, but with a good knot. Place a stick under the bandage and twist it round and round until the bandage is tight enough to stop the bleeding.

In order to avoid the danger of suppuration, often due to bacteria present on the skin itself as well as to those introduced by the instrument producing the injury, the slightest cut or scratch sufficient to draw blood should, as promptly as possible, be washed free from dirt, then dried with clean gauze, and painted with tincture of iodine. More serious wounds should be dressed temporarily, until the doctor can attend to them, by covering them with surgeons' gauze fastened on with a bandage. A doctor should be consulted about even the slightest scratch if, after a few days, it is red, hot, or painful; and a deep wound, particularly if produced by a rusty nail or other dirty object, should

always receive prompt medical attention. Any wound will heal without much pain or redness if there are no bacteria present.

**Nosebleed.**—Nosebleed may be due to some slight injury, or, as often happens with children, it may come on without any injury at all. It is usually not serious. Slight nosebleed does not require any treatment, but if it continues the patient should be put in a chair with his head hanging back and his collar loosened, and a cloth wrung out in cold water should be placed at the back of the neck. A plug of cotton inserted into the nostril affected will help to retard bleeding, and pinching the soft part of the nose is also effective in some cases.

**Treatment of Burns and Frostbite.**—If the clothing catches fire there is only one thing to do and it must be done quickly: *Smother the flame.* Fire needs plenty of oxygen, and if a person whose clothing is on fire is quickly and closely wrapped in a coat, shawl, blanket, or rug, the fire will go out. It is important to remember to wrap the cloth *from above down.* If the wrapping is done from below, the flames may be driven up and inhaled into the lungs with very serious results. If the clothing catches fire when one is alone, one should not run for help but should lie down flat at once and roll over and over on the floor or on the ground, to smother the flames.

In the case of a slight burn which only reddens the skin without forming a blister the pain will be lessened if the air is kept from the burned place. A paste of ordinary baking soda and water applied to the burn will do this, or carbolized vaseline or any grease, like

lard or mutton tallow, may be used instead. The burn should then be covered by tying a piece of cloth or bandage around it. If there is extensive blistering, the application of soda or vaseline may do harm; and severe burns should be dressed to prevent infection, as in the case of the serious open wounds described above.

If ears, nose, or fingers are frostbitten, the affected part should be rubbed with snow or very cold water until the blood has come back and the flesh begins to sting and burn. On no account should the person go into a warm room until this has been done, and until the frozen part has been gradually warmed by rubbing. Even after the circulation has come back, the patient should not be brought into a very warm place too soon.

**Injuries to Joints and Limbs.**—The pain and swelling of an ordinary bruise will be much less, if something cold is applied at once to drive the blood away. Ice in a cloth may be used, or simply a cloth wrung out in cold water.

If a joint has been *sprained*—which means that the ligaments that hold the bones together have been strained or torn—the same treatment with cold cloths is very useful and should be kept up at intervals for twelve hours. In the case of old and enfeebled patients, hot wet cloths are better. Sprains are often troublesome, and if a sprain is at all bad the doctor should be sent for.

If a bone is broken, medical care is, of course, necessary. While waiting for the doctor, the only thing to do is to keep the broken limb in as comfortable a position as possible. *Do not let the limb bend* at the

place where the bone is broken, because that gets the splinters of bone out of place, and may drive them through the skin and lead to an infected wound. Methods of giving first aid in the case of broken bones are described in the Red Cross Manual.

**Fainting and Sunstroke.**—Fainting, or growing dizzy and losing consciousness, is caused by a temporary failure of the circulation to send enough blood to the brain to keep it acting. People may faint from many causes, most of which, in the case of young people, do not indicate anything particularly serious. Fainting is often caused by the hot, stuffy air of a badly ventilated room. The two things to be done for a person who has fainted are to get him into a horizontal position so that the blood may go back to his head, and to cool off his skin, which tends to send the blood inward. The person should, therefore, be placed in a current of air—outdoors, if possible—and laid on his back with his head flat, either on the ground or on a couch without a pillow. The clothing around the neck should be loosened. It often helps to sprinkle a little water over the face. Nothing should ever be poured down the throat of an unconscious person, except by a physician, as such an attempt by one who is unskilled may lead to choking.

A person who has become faint and dizzy from the direct effect of strong sunlight shining on the head should be placed in a seated position in the shade. His clothing should be loosened, and cold water poured on his head, or his body rubbed with bits of ice. Cool drinks should be given if possible.

Heat prostration, due to excessive heat acting on

the whole body and not to the direct sun's rays, should be treated somewhat differently, on account of the fact that in such a case the blood vessels all over the surface of the body will be dilated. The patient should be laid flat on his back in a cool place, his clothing loosened, and his hands and feet rubbed to restore the circulation. The feet and body should be bathed in *warm* water and *warm* drinks should be given.

**Asphyxiation and Artificial Respiration.**—When a person has been under water for a long time the breathing stops and unconsciousness results. The same thing occurs on exposure to suffocating gases, such as illuminating gas. In cases of electric shock the problem is similar, since the chief result of such a shock is the stoppage of respiration. In all these cases recovery will generally follow, if respiration be started again. The important step to take is to institute artificial respiration *as promptly as possible.*

In the case of electric shock it is, of course, first of all essential to rescue the victim from the action of the electric current, since the danger increases greatly with the length of exposure. If the current can be shut off, this is the simplest procedure. A live wire may be flipped off the patient with a dry board or stick, or it may be cut with an ax or hatchet with a dry wooden handle. Dry wood is essential, because water is a good conductor of electricity, and wet wood or metal would transfer the current to the rescuer.

Artificial respiration should be begun by laying the patient face downward upon the ground. Where the patient has been rescued from the water, the feet should be raised and the body placed in a position to

permit any excess water to drain out from the air passages of the lungs. Stretch the arms of the patient straight above his head and let them rest on the ground in that position. Turn his head a little to one side so that the air will not be impeded in entering the nose and mouth. Next stand astride of the patient, with your body directly over his hips and facing his head. Put your hands on each side of his back, below the shoulder blades. Your hands now rest upon the patient's lower ribs. The fingers are spread out, pointed toward the head and away from the spine. Swing your body forward, keeping your arms straight and allowing your weight to rest on the patient's back; then swing back, taking all your weight off the patient. Do this fourteen to sixteen times per minute, to imitate the motions of breathing. When you put your weight on the patient, you press his chest together and force the air from the lungs; when you release the pressure, the chest springs back into place, and the lungs expand and draw air into them.

*Recovery may be very slow; keep up your work for at least two hours.*

While this process is going on, the patient's clothing should be removed. If necessary, he should be dried with a towel and then covered with a blanket. This work must not interfere with the operator who is carrying out the artificial respiration. Compel bystanders to stand back. The patient needs every bit of fresh air he can get.

When the patient begins to breathe—but not before—he should have his legs and arms rubbed *toward* the body. This should be done without removing the

blanket. The patient will not breathe well all at once, and it will be necessary to help him at first by continuing the artificial respiration every little while, particularly of course, if breathing should stop at any time.

After the patient is breathing well, put him to bed. Surround him with hot-water bottles and cover him well. As soon as he can swallow, give him some hot coffee. Open the windows wide, and allow him to sleep quietly.

**First Aid in Cases of Poisoning.**—If some poisonous substance has been taken into the system, the first thing to do is usually to get it out of the body again as quickly as possible by causing vomiting. This may be done by running the finger down the throat, by making the patient drink a large quantity of warm water, or by giving him some substance which will cause vomiting, called an emetic. A teaspoonful of mustard or salt in a glass of lukewarm water will serve as an emetic. Promptness is more important than an exact dose. After the emetic has been taken, large quantities of warm water should be drunk to dilute the poison that remains.

In the case of various poisons special treatments are required. Thus, the antidote for carbolic acid is alcohol followed by mustard as an emetic, both treatments being repeated several times if necessary. For irritant poisons, such as tartar emetic, arsenic, and lead salts the emetic should be followed by water and then by milk or white of egg. Corrosive poisons, such as strong acids and alkalies, require something that will neutralize the poison—plaster, magnesia, or baking

powder, in the case of acids, or vinegar, lemon juice, or orange juice, in the case of alkalies—followed by large doses of oil or milk and eggs beaten up, to dilute the remaining poison and soothe the irritated tissues of the alimentary canal. Finally, strong stimulants may be given, such as strong tea or coffee or ammonia.

It is of course impossible for the ordinary layman to keep all these treatments in his head and dangerous to attempt to rely on memory. A book on first aid containing directions for each specific case should always be at hand for reference.

Most of the snakes found in the United States are harmless, but there are three—the rattlesnake, the copperhead, and the water moccasin—which are very poisonous. If a person is bitten by one of these snakes, a handkerchief should be tied between the bitten part and the heart, and twisted tight by means of a stick, so as to compress the blood vessels and prevent the poison from being carried to the rest of the body. Then as much as possible of the poison should be sucked out of the wound. This may be done with safety, as the poison will not injure the mouth if it is spit out at once, unless one has cuts or scratches in the mouth. The idea that persons who have been bitten by a snake should be treated by large doses of alcohol is a fallacious one.

The stings of insects found in temperate climates rarely do any harm unless disease germs of some sort are carried with them. The pain of a bee sting may be relieved by applying some alkali, like soda or ammonia, and, to a considerable extent, by merely plastering a little wet mud on the place bitten.

## Topics for Investigation and Discussion

1. Safety first campaigns; their management and their results.
2. The use of the poster in teaching safety first.
3. The causes of most modern accidents.
4. The Boy Scout movement and first aid.
5. Accident insurance in industry.
6. Shall the state insure workmen against accident?
7. Liability legislation and what it has accomplished.

# PART THREE

## *METHODS*

"What the best and wisest parent wants for his own child, that must the community want for all its children." JOHN DEWEY.

## CHAPTER XVIII

### THE LAWS OF LEARNING IN THEIR APPLICATION TO HEALTH

"The same laws of learning govern the formation of health habits that are fundamental for forming any other habits." To inculcate any habit, three steps are necessary. First, the child should get a clear picture of the habit to be established; second, the teacher should provide opportunity for the practice of the habit; and third, the correct habit should bring such results that the child will feel satisfaction in the doing of it until its doing becomes second nature to him. Teaching health means merely the use of these simple principles with applications to health.

**Understanding What to Do.**—To form any health habit, the teacher must first be sure that her pupil understands what the health habit is. Suppose, for example, that the teacher is stressing the use of the handkerchief in coughing and sneezing. The first step is to teach the child why the handkerchief should be used and how to use it properly.

Various means may be utilized to bring clearly before the child the habit he is expected to learn. First of all, the teacher should show, by concrete example, how the handkerchief should be held. She may follow this by a short talk on the reason for

guarding the mouth when coughing. Posters may be used to illustrate the use of the handkerchief; or, even better, the children may make such posters for themselves. In one school a primary teacher achieved excellent results by having her class discuss each morning the health habit she was trying to force home and the ways in which it might be acquired. She had frequent handkerchief drills and review questions on the subject of avoiding colds and spray-borne diseases to keep constantly before the child the habit to be formed. When a child sneezed or coughed without using his handkerchief, she asked the class what the coughing child should have done and why.

**Giving Opportunity for Exercise of the Habit.**—It will do little good for the teacher to talk to her class about the use of the handkerchief if each member of that class is not provided with one, or with a satisfactory substitute. At morning inspection, the teacher should see that each child has a clean handkerchief. In every way possible the pupils should be encouraged to bring handkerchiefs of their own with them. If the pupil neglects to bring one, a note to the parent, outlining the health habit being taught and asking that the child be given a clean handkerchief each morning, will usually bring coöperation from the home. But there will always be some child who will come to the classroom unprepared for the handkerchief drill. To prepare for this, the teacher should keep on hand in the classroom a supply of paper napkins or squares of cheesecloth.

Giving the child opportunity to exercise the habit once a day is not enough. If a child coughs

without using his handkerchief, the teacher may remind him of what he should have done. When the teacher herself coughs, she should be careful to use her handkerchief in the proper way.

While it is generally desirable to establish one health habit at a time, the teacher should avoid the temptation to make any particular procedure a panacea for all ills. Thus, it may be pointed out at the proper time that even when the handkerchief is used with all possible care the hands cannot fail to become somewhat contaminated with material from the mouth and nose and that germs may therefore be transmitted to pencils, books, and the like. One's own handkerchief is the only article that should be brought in contact with the nose. The mouth should be guarded from contact with everything but the handkerchief, eating utensils, and toothbrush. Furthermore, the teaching of the handkerchief habit should ultimately lead to a conception of the fact that children who are coughing or sneezing to any considerable extent should be at home and not in school at all.

**Providing Satisfaction for Practicing Health Habits.** —The third step in forming correct health habits is to provide some means whereby the child will be so encouraged to do the act, that he will find pleasure in doing it. It is only by providing such feeling of satisfaction that the child will receive the stimulus to continue the practice of his health habit until it becomes automatic and second nature with him. The sentiment of the group is one of the strongest factors that can be used in habit formation. The teacher, then, should endeavor to create in her classroom an atmosphere

favorable to health and an atmosphere of approval for the children who carry out the habit conscientiously.

Some teachers have found it helpful if they appoint, as daily inspection leader, the child who has been most regular in bringing his handkerchief to school and using it while in the classroom. A record may be kept, and at the end of each week the child standing highest on physical inspection and handkerchief drill may be appointed inspector for the ensuing week. Children like to feel their importance and to shine as leaders among their schoolmates. Such weekly appointment of inspectors usually does much to improve the daily practice of health habits.

**Necessity of Coöperating with the Home.**—The influence of environment cannot be too heavily stressed. For the creation of the proper schoolroom environment, the teacher is responsible. Habits in children, however, are often already formed before they come to the teacher, and frequently the teacher's efforts to form desirable habits are neutralized by unfortunate home environment. To obtain the best results the teacher must strive as far as possible to secure the coöperation of the home in building up an atmosphere of approval for the health habits she is teaching. Some teachers find it helpful to invite the mothers of their pupils to their classroom once or twice a year and discuss with them informally the health habits they are trying to form and the need for home coöperation in their work. Other teachers utilize meetings of mothers' clubs and parent-teacher organizations to help bring about a closer union of home and school forces in establishing sound health habits.

**School Health Leagues.**—Following the principle of "learning by doing," the laws of personal hygiene can be best taught by the cultivation of individual health habits. In the same way responsibility for community sanitation should be developed by organizing the school children to take an active part in securing and maintaining good environmental conditions for the life of the school itself.

In many states teachers have found the formation of school health leagues one of the most vital forces for securing the proper environment for stressing and teaching health habits. Such a health league interests the children in health work by permitting them to map out and apply to themselves a concrete program of activity. It provides them also with the necessary social approval for their performance of the habit and brings them satisfaction enough to keep them repeating it. By putting in their hands daily inspection and enforcement of health habits, the members of such health leagues are led to observe two principles vital to good citizenship—protective interest in other people and a real participation and coöperation with them in the attainment of a common goal. The league develops the pupil by permitting him to share responsibility for carrying out health principles in the school, although the teacher must retain general supervision and direction of its working. The Virginia Department of Health[1] describes the organization and duties of leagues in detail. The following are essential features of their organization.

[1] Bulletin XVI, No. 2, February, 1924, *Health Leagues in the Schools.*

When a Health League is to be formed in a school, each room should discuss the proposed program. The first step should be an explanation of the purpose of the League, its plan of organization, and the duties of each of its officers. After each group understands the nature of the organization and method of procedure, the principal should call together the pupils and should act as chairman during the organization and the election of Chief Health Officer and Assistant Chief Health Officer. If the school or grade is already organized, a much simpler plan is to have the work of the league done through a health committee of the existing organization.

**Organization of the Health League.**—The officers of the League are: A Chief Health Officer, an Assistant Chief Health Officer, Deputies, and Room Health Officers. Except the Deputies, all officers are elected by the pupils. The Chief Health Officer and the Assistant Chief Health Officer serve half a session, the elections taking place at the beginning of each term. The Room Health Officers serve for one week only; new officers are elected each Friday. This should give every pupil an opportunity to be a Room Health Officer at least once during the session. The Deputies are appointed by the Chief Health Officer and serve one month; at the end of that time others are appointed by the Chief Health Officer.

The procedure of the election is as follows:

First, the Principal, after assembling all the pupils, calls for nominations from the floor for Chief Health Officer. The names should be written on the board. The vote should be taken by written ballot. Should

the Chief be a boy, the Assistant Chief should be a girl. The Assistant is likewise elected by the majority of votes. After the Chief Health Officer and the Assistant Chief Health Officers are chosen, the pupils should return to their rooms for the election of their Room Health Officers, who, together with the Chief Health Officer, Assistant Chief Health Officer and their Deputies, constitute the officers of the League. Each room is then asked to put up two names for its Room Health Officer. The one receiving the majority of votes is elected. Only the pupils in any particular room are privileged to vote on the Health Officer for that room. No room officer may be re-elected until each pupil in that room shall have served a term.

**Duties of the Room Health Officer and Room Committee.**—The Room Health Officer should be responsible for the general order and cleanness of the room, for the management of the shades, so as to secure good lighting and of the radiators, windows, and other devices to secure good air conditions. He or she should read the thermometer at least twice daily and record the reading on a permanent chart. It should also be a part of the Room Health Officer's duty to encourage the reporting to principal or school nurse of all children showing signs of communicable disease; to stimulate the development of health habits and personal cleanliness on the part of all the pupils; and to report at the end of his weekly term to the Chief Health Officer on the progress made along health lines.

A Daily Inspection Committee may be organized in each room for the encouragement of personal cleanliness. This committee should inspect the children for

clean nails, hands, faces, teeth, necks, ears, and handkerchiefs. Another duty should be to watch for symptoms of illness—unusually flushed or pallid faces, skin eruptions, and coughs.

A Health Habit Committee should encourage the members of the League in every way possible to form and practice regularly the following habits, but no attempt should be made to record findings. The importance of keeping the following rules should be discussed with the parents and their coöperation secured:

Sleep with your windows open.

Brush your teeth before going to bed and before coming to school.

Drink at least three glasses of water daily.

Drink milk or water instead of coffee or tea.

Eat some fruit and green vegetables each day.

Wash your hands before each meal.

Take one or more baths a week.

Play out of doors each day.

The Health Habit Committee is charged with the enforcement of health rules, and there is no reason why the following should not be rigidly enforced:

Bring a clean handkerchief to school each morning.

Bow your head or cover your nose and mouth when you sneeze or cough.

Keep pencils, fingers, and everything except food and toothbrush out of your mouth.

Avoid using a common drinking cup.

**Keeping the Records.**—As an incentive to interest in this work there should be some system of recording progress. The plan shown on p. 226 is merely suggested as one of many methods for encouraging improvement.

In any scheme for checking or recording the formation of health habits, care should be taken to avoid tempting children to tell untruths and to avoid hurting their feelings in regard to conditions over which they have no control. All undue embarrassment can be prevented by teachers who have a sympathetic understanding of the children and plan their programs so that the health work is the natural outgrowth of the daily activities of the school.

The purpose of the League is coöperation in the effort to establish health habits in the individual and in the group concerned. All records should therefore make provision for showing the united effort of the various groups. Each child should have as his motive to beat his own past record. Each day's check should show progress made.

**Direction for Keeping the Score.**—Every day just before dismissal the Chief Room Health Officer should see that the record shown is checked correctly. Opposite each habit should be written the number of pupils keeping the rules while in the school that day. In the first column the attendance for the day, and in the second column the number of those keeping the rules, should be recorded. This may be kept on a piece of paper posted in a convenient place. Each child should report for himself before the entire grade. Every Friday afternoon the score for the week should be reported to the Chief Health Officer. At the end of each month the Chief Health Officer should make a report to the principal, and the annual score showing the percentage of pupils in each grade who were given a physical inspection, who had defects corrected, who

PROGRESS SCORE

| | MONDAY | | TUESDAY | | WEDNESDAY | | THURSDAY | | FRIDAY | | PROGRESS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO. PUPILS PRESENT | NO. KEEPING RULES | NO. PUPILS PRESENT | NO. KEEPING RULES | NO. PUPILS PRESENT | NO. KEEPING RULES | NO. PUPILS PRESENT | NO. KEEPING RULES | NO. PUPILS PRESENT | NO. KEEPING RULES | |
| 1. Bring a handkerchief to school each morning. | 30 | 26 | 30 | 27 | 30 | 27 | 30 | 28 | 30 | 29 | 3 |
| 2. Bow your head or cover your nose or mouth with a handkerchief when you cough and sneeze. | | | | | | | | | | | |
| 3. Keep pencils, fingers, and everything except food and toothbrush out of your mouth. | | | | | | | | | | | |
| 4. Avoid using a common drinking cup. | | | | | | | | | | | |
| 5. Wash the hands before lunch. | | | | | | | | | | | |
| 6. Eat a properly balanced meal for lunch, including if possible, a glass of milk. | | | | | | | | | | | |
| 7. Maintain a good posture when sitting or standing. | | | | | | | | | | | |
| 8. Take a vigorous and co-operative part in school games and exercises. | | | | | | | | | | | |

had no defects, and who formed the four health habits, should be posted where all the school can see it. The grade which makes the most progress during the year may be rewarded by being allowed to plan and carry out a program for Health Day.

WEEKLY REPORT OF ROOM HEALTH OFFICER
TO CHIEF HEALTH OFFICER

For week ending..............................
Average daily attendance........................
Average number of pupils keeping rules............
Percentage of pupils keeping rules.................
Average temperature of room at 11:30 A.M..........
Average temperature of room at 3:00 P.M...........
Number times room was aired....................

**Committees Representing the School as a Whole.**— A Committee on Fly Prevention should be organized under a Deputy Health Officer to make a careful study of neighboring manure piles, rubbish heaps, and the like to find out where maggots are breeding and to make recommendations as to the control of such dangers. Boys who are clever at carpentry should be interested in building fly traps for the yard and schoolrooms. Specifications may be obtained from the state board of health or from the United States Bureau of Entomology at Washington. Where mosquitoes are prevalent, a Committee on Mosquito Control should locate any breeding places in the vicinity and determine whether the larvae present are of the malaria-carrying species.

A Committee on Water Supply should study the source of water supply in use by the school or the

community, in the light of instruction given at one of the meetings of the League. This committee should be charged particularly with the duty of observing and guarding against the use of common drinking cups.

A Committee on Toilet Facilities is charged with supervision of the cleanliness of toilet apartments. Washing facilities and the danger of the common towel fall within the scope of this committee's work.

A Committee on School Buildings and Grounds should be responsible for the general neatness of the school building and surroundings and for the supervision of the results attained along this line by Room Health Officers in the individual rooms.

A Committee on Ventilation, Lighting, and Seating should review the records made by Room Health Officers, should study the general problem of heating and ventilation in the school, and make recommendations through the Chief Health Officer to the principal in regard to the operation of the heating plant and the use of windows and other ventilating devices. It may also study the adequacy of lighting in the schoolrooms and the adaptation of school seats to the needs of the pupils.

**Duties of the Chief Health Officer.**—The Chief Health Officer with the aid of the Assistant Health Officer should compile weekly reports from the Room Health Officers as to temperature findings and the practice of health habits, as well as the reports, to be made perhaps monthly, by the Deputy Health officers in regard to the more general problems of school sanitation. Their duties include also supervising the work of all Deputy and Room Health Officers, and

making reports to the principal on routine progress, with recommendations as to desirable changes in policy or procedure.

MONTHLY REPORT OF CHIEF HEALTH OFFICER TO PRINCIPAL

Month ending..................................
Kind of Health Campaign.........................
Condition of playground..........................
Boys'....................................
Girls'....................................
Number rooms having thermometers...............
Number rooms properly ventilated.................
Number rooms showing increase in percentage of those keeping health habits...................

When the teacher has clearly understood the fundamental laws of learning and applied them to health problems she is ready to work out a specific teaching program adapted to the needs of her classroom group. Suggestive programs are outlined in the chapters that follow.

TOPICS FOR INVESTIGATION AND DISCUSSION

1. The necessary steps in establishing any habit.
2. The importance of the coöperation of the home with the school in inculcating health habits.
3. The school health league as an agency in forming health habits.
4. Methods of applying the fundamental laws of learning to health problems.

# CHAPTER XIX

## COURSE OF STUDY FOR GROUP ONE—FIRST, SECOND, AND THIRD GRADES

For the primary grades the program should be simple and the habits and principles emphasized should be such as the child can easily grasp and habitually apply.

**The Medical Examination.**—The child should be started right at the beginning of his school life. Since his progress is directly dependent upon his physical fitness, several states require each child to be examined by a licensed physician when he first enters the school. In California, to facilitate the proper carrying out of such a medical examination, the State Board of Education suggests that the teachers and principals coöperate by ascertaining in May of each year what children are expected to enter school the following fall and writing to the parents of these children to ask that they be examined by a physician and any necessary treatment be given; by checking up on the children entering school in the fall to find which of the new pupils have not been thoroughly examined within the preceding six months; and by writing to the parents of such children, suggesting the advisability of a medical examination.

**Physical Inspection.**—In several states, a physical inspection by the school nurse, the physical director,

or the classroom teacher is required instead of a medical examination by a physician. Such an inspection covers weighing, measuring of height, testing of ears and eyes, inspection of teeth, and inspection for indications of mouth breathing. The child's first physical inspection should determine whether proper vaccination against smallpox has been secured. If the pupil has not yet been vaccinated, the teacher or the person making the physical inspection should explain the inoculation to the child in a clear, simple way to remove fear of the operation.

In some states, annual physical inspection by the teacher or the physical instructor is required by law. Such states usually supply special report cards for inspections. These cards accompany the child throughout his school life, furnishing a year-by-year record of his physical history while in school.

Even when it is not required by law, the classroom teacher will find an annual physical inspection of her children helpful. The defects she discovers should be tactfully called to the attention of the parents with the suggestion that the child be examined by the family physician.

**Daily Inspection.**—Health instruction in the primary grades should begin with the school day. The first step should be the daily inspection. This can be conducted by the teacher as the children enter the room or immediately after they have been seated. Such an inspection should gradually include clean handkerchiefs, clean hands, nose, teeth, neck, and ears, in a way not to embarrass the children. If any child shows symptoms of communicable disease, the teacher should

immediately isolate the infected pupil and notify the school doctor or nurse. Where medical or nursing service is not available the sick child should be sent home at once, if he lives near the school or if he has an older brother or sister who can go with him.

A short talk on proper bathing habits and the use of the handkerchief when sneezing or coughing may follow the daily inspection. Handkerchief drills can be made exercises in both personal and social conduct by stress upon the courtesy and consideration due others as well as protection for the individual. The removing of wraps and rubbers when coming indoors and putting them on again when going out should be taught.

**Classroom Health Habits.**—During the day the teacher will find opportunities for discussing and illustrating proper standing and sitting posture. The evil effects of wrong posture should be touched upon lightly, while the reasons for correct posture should be explained and illustrated (see Chapter V). The child should also be taught proper reading habits—how to hold his book, and to sit so that the light may fall upon it over the left shoulder, and simple rules for the care of the eyes, such as keeping away soiled hands and towels, providing rest periods for them by occasionally looking from near objects to far objects, or from far to near. If the teacher or a pupil at the blackboard gets a bit of chalk dust in the eye, the proper procedure for removing foreign particles from it may be taught.

**Food Habits.**—The lunch time is one of the most important periods of the day for the establishing of sound health principles. First of all, the child should

be taught to wash his hands before eating or before touching the food. If paper towels cannot be provided, each child should be taught to bring his own towel, to keep it upon a hook set apart for it, and to replace it with a clean one at proper intervals. The courtesy of saying "Please" and "Thank you," the proper order of setting a table, arranging chairs and serving food, and cleaning up after the meal should be driven home by concrete examples, especially if the school has facilities for serving lunches.

The importance of right food can be taught easily and effectively if the teacher will provide a model lunch. Items of the lunch should be selected to make a well-balanced meal, and each article of food should be wrapped in waxed paper. As a teacher unwraps the food she should explain why waxed paper or the napkin was used. She should also explain why the various articles of food were provided and their place in a well-ordered menu. In connection with the lunch or with the meal provided by the school, the teacher may stress proper foods and their preparation in the home. The value of green vegetables and fruits can be brought out in a story woven about some vegetable in season. The children should be encouraged to bring milk with them for lunch, and the teacher should provide means for its proper serving.

**Hot Lunches.**—Wherever possible, one hot dish should be provided for the children's lunch, particularly in cold weather. This may be a vegetable soup of a kind that will be nourishing and palatable. One easily prepared and highly nutritious soup sufficient to serve fifty may be made from the following recipe.

- 2 shins of beef (5 pounds)
- 10 quarts cold water
- 6 quarts boiling water
- 2 cups carrots (cut up)
- 2 stalks celery (cup up)
- 2 quarts tomatoes
- 2 cups cut-up cooked Irish potatoes
- $\frac{1}{4}$ teaspoonful black pepper
- 2 onions cut up fine
- 4 tablespoonfuls chopped parsley
- 4 tablespoonfuls salt

Put the shins on the stove in 10 quarts of cold water and cook for one hour. Then add 6 quarts of boiling water and all the vegetables and seasonings and cook from one to two hours longer.

Cocoa may be substituted for the soup if desired. A very good recipe sufficient for fifty servings is:

- $1\frac{1}{2}$ cups cocoa
- 2 cups sugar
- 8 quarts milk
- 1 quart boiling water
- 1 pint cold water

Let the milk and one quart of water come to a boil. Mix cocoa and sugar gradually with one pint of cold water to make a smooth paste, pour into boiling milk, beating for about two minutes.

In some Wisconsin schools each child brings with him in a pint fruit jar soup, mashed potatoes, or a creamed vegetable. This jar of food brought from home is placed in a double boiler about eleven o'clock and is hot and appetizing by lunch time.

The child should be encouraged to use milk and water in place of tea and coffee, and to drink at least four glasses of water and a quart of milk each day. If there are no sanitary fountains, the teacher should require the children to bring their own cups. These should be rinsed daily and washed with boiling water once a week. At school a screened shelf or individual bags should be provided for the cups.

**Coöperation with the Parents.**—In the matter of diet the coöperation of the home is essential. Through conferences with parents the child may be taught both at home and at school to use milk, fruit, green vegetables, and cereals. As already indicated, the home may be asked to provide the food that is to be heated at school for the child's hot lunch.

Visits or personal notes from the teacher may obtain for the child proper home supervision of sleeping in the open air, the weekly bath, night and morning use of the toothbrush, proper hours of sleep, and the habit of evacuating the bowels regularly. Card system reports to parents have been utilized by some teachers in getting the coöperation of the home, but visits from the teachers and the nurses are always more effective. If the child is taught to make health posters and to carry them home to his parents, he will frequently enlist their sympathetic aid in the preservation of his health.

The following is a description of a health book used in this way with good results. The three health rules contained in the book had been discussed previously.

### A Health Book

#### FIRST GRADE

Materials—Three sheets of medium-weight paper 12″×18″
Cord for tying leaves together
Strips of paper containing health rules printed or written
Pictures illustrating rules cut from magazines

Rules—(1) I must eat foods that make me strong (vegetables, fruits, other foods)
(2) I must have fresh air
(3) I must keep clean

On the cover the children or teacher printed with printing press or crayon

*My Health Book*

(Some of the children decorated their book covers with pictures of happy, healthy children cut from magazines.)

At the top of the first page was pasted the strip of paper with the first health rule, and under that *Vegetables.* On that page were pasted pictures of vegetables cut from old magazines.

The second page contained *Fruits*, and the third *Other Foods.*

Pasted at the top of page four was the second rule of health. On this page and the one following were pictures of children playing out-of-doors—all pictures cut from magazines.

The sixth page was given to the third rule of health, and pictures illustrating it.

With children of these grades, health posters, health poems, and health plays, such as are described in later chapters may also be used to great advantage.

**Fire and Traffic Instruction.**—The child in the first three grades is not too young to be taught fire prevention. Fire drills should form a regular part of the school program, and each child should be taught what to do if his clothes should catch fire.

With the volume of traffic annually increasing in every part of the United States, we cannot begin too early to teach the school child a few simple rules for protection against automobile traffic and for watchfulness at railway crossings. Many of the automobile associations and railway corporations have large posters graphically illustrating the right and wrong method of crossing streets or railroads. These, the teacher may usually obtain upon request.

The meanings of danger signs, the use of red flags and lanterns, can be impressed upon the child's mind

through story, picture, and discussion. The danger of stealing rides on autos or wagons, of alighting from or boarding moving cars, of utilizing public streets and highways as playgrounds, should be stressed.

The usual laws of auto traffic—the practice of extending the driver's arm horizontally to the left when he turns left, extending it left and up when he turns to the right—can be dramatized by having the class play auto for a few moments, using the aisles between the desks as roads and streets. One child may be a driver, another a pedestrian, and the remainder may act as traffic officer and spectators to check up on the correctness of the traffic signals given. The children can be taught through dramatizations the right and wrong way of alighting from vehicles, how to avoid danger in walking along public highways, and in crossing railway crossings.

**Sanitation and Cleanliness in and about the School.**—In these grades the teacher begins to develop in the child a love for the beautiful. She may encourage him to do what he can to beautify his surroundings by cultivating flowers in yards and in window boxes, and by planting trees on Arbor Day. The child should be taught that cleanliness and order are among the first laws of beauty and that he should take his part in keeping the schoolroom and school grounds clean and attractive.

Where possible, the teacher should permit the pupils to help in eraser dusting, washing of blackboards, and in keeping the room in order. In some of the Wisconsin schools the school society appoints regular committees of children to help in these tasks, service upon such a

committee being considered a mark of honor. Lists of the members are posted, and they are changed often enough to give each child a chance for coöperative effort in keeping his school in a presentable state. In the Wisconsin rural schools, at the opening of each school term a circular letter is sent to the clerk of the school, suggesting to him methods of putting the school into proper condition. The schools of Sauk County are thoroughly cleansed three times during the school year and mopped once each month. If the teacher lacks janitor facilities she can modify the Wisconsin committee plan and not only insure herself sanitary classrooms but also train her pupils in coöperative work for a common health aim—cleanliness.

**Physical Activities.**—No rational program of health teaching can ignore the tremendous advantages of organized play, sport, and school athletics. Place for each of these body-building activities should be given in the health-teaching schedule. The physical activities for the primary group should be informal, imitative, and rhythmic, and should be limited to the big muscles of the body. Illustrative games for this group are described on pages 308–312 of this book.

**The Positive Attitude in Health Teaching.**—If in the first three grades we firmly establish in the child the habits of

Securing ample sleep
Sleeping with the windows open
Taking proper care of the teeth
Drinking sufficient pure water
Using milk (one quart a day) instead of coffee or tea

Eating fruit and green vegetables each day
Washing the hands before each meal and after going to the toilet
Using the handkerchief when coughing and sneezing and keeping contaminated objects away from nose and mouth
Taking a bath at least once a week
Coöperating with others in social health measures

we shall have progressed in the creation of a health consciousness that will yield results not only throughout the school period but throughout the child's entire life. It is better to have these few habits firmly established and their importance stressed than to discuss many others that are never practiced.

The teacher should not use fear as a motive for habit formation. This is the negative and harmful attitude. The child should be impressed always with the *positive* side and the importance of doing the right thing in the right way. The proper mental attitude, a willingness to protect himself and his neighbor, and an atmosphere of happiness and encouragement are conducive to health.

### Topics for Investigation and Discussion

1. The outstanding characteristics of a health program for the primary grades.
2. What every teacher should know about the physical condition of her pupils.
3. Supervision of the lunch period.
4. The positive attitude in health teaching.

# CHAPTER XX

## COURSE OF STUDY FOR GROUP TWO—FOURTH, FIFTH, AND SIXTH GRADES

Health teaching is cumulative—that is, the teacher needs to be sure that the foundation of previous instruction is sound, and to continue to broaden this foundation by establishing new habits. In outlining the work for the second group two factors are to be borne in mind—first, constant review of previous health rules, and second, progressive formation of new habits.

**Points for Review.**—The health habits taught in the lower grades should be frequently reviewed, and the relation of these habits to physical well-being should be brought out. The teacher should emphasize the importance of individual sanitary drinking cups and towels, the eating of suitable food at regular hours, and the necessity of playing each day out of doors. The teacher should make every effort to see that there is provided in the classroom a proper environment, including heating, lighting, and ventilation. The child should again be taught the importance of sleeping with the windows open, of wearing the proper clothing, and the right sort of shoes. One way of checking up on the continuance of health habits learned in the lower grades is to make the physical inspection a part of

each day's program. Since the children are now older, much of the work of this inspection may be put upon them as suggested in connection with the organization of Health Leagues in Chapter XVIII. The daily program, the lunch hour, and the relaxation periods should conform to the best health standards.

**Health Habits for Home Cultivation.**—In all work with this group the teacher should emphasize again and again the formation of proper health habits for the home, particularly those relating to sleeping and personal cleanliness. Children in this group need from ten to eleven hours of sleep each night. They should be taught to open the windows at top and bottom so that a current of air may circulate through the sleeping room.

Since the child's mind is now more mature, the reason for proper clothing and bathing may be clearly presented to him. Bathing or rubbing cleanses and invigorates the skin by promoting the activity of its blood vessels and glands (see Chapter VIII). The teacher can emphasize this point if she will wash her hands with soap before the class and explain its function in the cleansing process.

The child should be taught how to hold and manipulate the toothbrush and should understand why the brush should be rinsed after being used, and hung in a clean place. The child should also be cautioned not to use the brush after the bristles become flabby or loosened. The proper toothbrush should have bristles neither too stiff nor too close together. Pupils should now know the necessity of going to the dentist twice a year for a regular examination.

In connection with oral hygiene the teacher may first bring out the importance of keeping the mouth clean. She should caution the child never to spit on a sidewalk nor on the floors of buildings or cars. Many serious diseases are spread by spitting, among them tuberculosis, diphtheria, and common colds. Interesting posters on this subject may be obtained from public service corporations and state boards of health.

**Classroom Health Habits.**—Whenever the teacher observes any violation of simple health habits in her classroom she may make such infractions the opportunity for a talk on the proper habit. Keeping pencils out of the mouth, avoiding dust by cleaning shoes before entering the classroom, the frequent and proper dusting of erasers, the use of handkerchiefs when coughing or sneezing may be stressed as the need arises.

**Use of Posters and Dramatization.**—Posters are valuable aids in teaching health to children. The wise teacher will not only use the posters supplied by boards of health, tuberculosis associations, and public service corporations, but she will help her pupils design and made such posters for themselves. Children in the lower grades can make attractive health posters by clipping appropriate pictures from old magazines, mounting them with paste on backgrounds of colored, heavy paper, and lettering with colored crayons the health message to be taught. Free-hand paper cuttings, mounted in the same way, and printed in by hand, make attractive displays. In the upper grades, especially with children who receive regular instruction in drawing, more ambitious posters in free-hand drawing

and in colored inks and oil paints can be undertaken. Health posters can be used in enforcing health habits, in advertising the health plays the children may present in their school assemblies, and in supplementing the advertising of local anti-fly and anti-mosquito campaigns.


FIG. 13.—An effective poster in cut-out work.

The rules for poster making are simple. The poster should attract attention by its line or coloring and at the same time tell a health story or make a health announcement quickly, dramatically, and forcefully. The poster should tell only one health story or fact and tell it in such a way that the beholder will want to obey its message. In utilizing posters, the message and the presentation should always be constructive and

encouraging. It must not be morbid or disheartening, and its facts should not be distorted. Colors and designs should be chosen for their beauty as well as their message. Since posters are hung to be seen, the

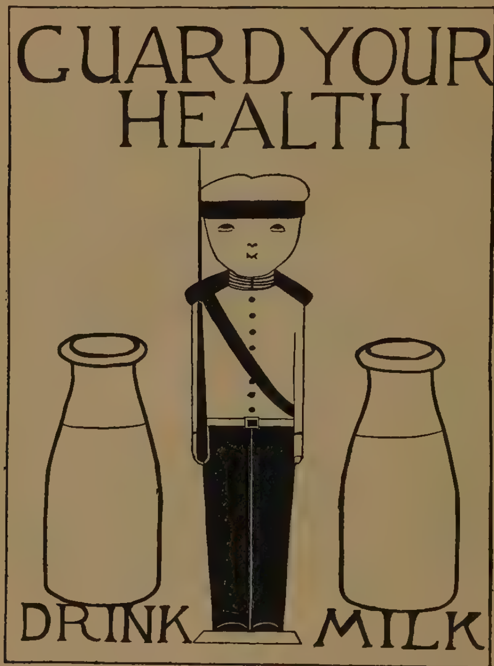


FIG. 14.—A more ambitious poster in pen and ink.

lettering and the design should always be large, clear, and easily read.

One very effective poster which is easily made can show a long train of cars, each car labelled with a health essential—fresh air, milk, etc.—and the whole labelled "The Fast Train to Healthland." The travel idea

can also be utilized in a "Go to Healthland by the Milky Way" poster. In this, a milk bottle may be drawn as an air ship flying along a milky path through the sky, indicated by gold stars. Old-fashioned balancing scales are easily drawn or cut from colored paper. They can be used as the feature for a Balanced Diet poster, with balanced foods heaped in each pan. The advertisements cut from old magazines can be utilized often and afford endless opportunities for originality in the grouping of the items, and in the use of color to enforce their teachings.

Not only do the posters help in establishing health habits on the part of children but they may also be used as a means for obtaining the coöperation of parents, if the teacher will have the children take home their posters.

Many teachers are using designs suggesting health activities as blackboard borders for their classrooms. Such borders can be sketched in free-hand and tinted with colored chalks, or the original work of the children themselves may be used. There are a number of attractive health borders ready for classroom use put up by school supply houses and health organizations.

Another effective method of emphasizing the importance of health habits and of arousing a health consciousness is the use of health dramatizations which will be discussed in detail in Chapter XXIII.

**Use of Textbooks.**—The children in these grades are old enough to be taught the use of a good textbook on health. In addition to the basal text, the teacher should see that a number of other texts are in the library and that the children are taught to use them.

As far as possible pupils should be encouraged to be independent in finding information on special health topics and in solving problems and projects that arise out of the actual schoolroom, community, and home situations.

**Life Processes.**—The child in these grades has developed sufficiently to begin the study of the life processes. Vivid illustrations of the effect of foods and the need of air and sunshine may be presented by growing hardy plants in the school or home gardens. The example will achieve best results when the plant is grown in the schoolroom itself. If this is done, the child will see the day-to-day development of the living organism and can have his attention constantly called to the forces that work upon it. For example, a bulb, a grain of corn, even an onion, may be grown in the dark until the sprouting stems are thoroughly whitened. If the teacher explains that the thin, whitened stems are due to a lack of sunshine, and then shows by putting the plant in sunlight how quickly it becomes green and healthy, she can impress the importance of this factor upon health more vividly than in any other way.

Similarly she can teach the importance of water, of proper temperature, and of soil foods by growing plants with and without water and by feeding them with solutions of proper and improper foods. Plants adapted for such classroom experiments are begonia, coleus, most bulbs, lemon, orange, and grapefruit seeds. The distribution of food throughout the plant by the movement of sap is vividly illustrated by putting a bit of celery, the bloom of a narcissus, or a white carnation in diluted red ink. In a few moments thin red lines

will appear in the plant showing that the ink is rising up through the plant's tissues. The teacher explains to the class that the sap circulates through the plant in the same manner that the ink does and that the sap is the blood of the plant.

An interesting way to teach the prevalence of bacteria is to expose a bit of moist bread to dusty air for several hours and then to place it under a glass cover. If the air under the cover be kept slightly moist, bread mold will soon develop.

An interesting experiment may be made with four bottles of fairly clean fresh milk. Pasteurize the milk in one bottle by heating it in a pan of water over an alcohol lamp in the classroom, or at home beforehand. Add some dirt to the milk in the second bottle. Then keep these two bottles and a third bottle in a cold place, and place the fourth bottle in a warm place. The bottles should be examined every day to see when each one curdles. This can be used as the basis for a discussion of food decay.

The fact that human beings breathe in oxygen and give off carbon dioxid is easily proved by the limewater test. The teacher should explain that carbon dioxid when brought in contact with a solution of lime causes the lime to separate from the water in solid particles. Into a little clear water put a few particles of lime, shake vigorously, and then pour off the clear liquid that results when the solution has stood for a few moments. If the teacher will blow through a straw into a glass bottle containing lime water, the liquid will turn a dirty cloudy white, indicating that she has blown carbon dioxid into it.

**Foods and Food Importance.**—In approaching the subject of food with children of this grade it is best to begin with a brief description of the cell theory. Point out that all living matter is composed of tiny units, called cells. Body tissue is composed of collections of these cells one upon another. Each cell has its own work to do but is also related to all other cells, so that the whole body may work together harmoniously. Each cell is a living thing, and as it performs its work it uses up some of itself. Food then must be taken into the plant or animal and carried to the hungry cells. In man food enters the body through the mouth. In the stomach and intestines it undergoes certain changes so that it may be absorbed. This change is called digestion. After digestion the food is taken up by the blood and carried to the cells, which take in the food and repair their waste. Not all of the cells in the body, however, require the same kind of food. Our bodies are made up of bones, flesh, and muscle, and the cells making up these separate tissues must have different foods to supply their needs.

In discussing the foods it will be found helpful to group them into those that build muscles, bones and teeth, and good red blood. The children may compile lists of foods for any one of these special building purposes. Foods are sometimes divided into two main groups—those that serve as fuel in the body, and those that keep it in running order. The energy-giving foods are sugars, starches, and fats. Under sugars we may class commercial sugar, molasses, honey, candy, sweet fruits, and the sugars in milk. The cereals, bread, potatoes, and a few vegetables supply starch. Meats,

nuts, butter, olive oil, eggs, and milk are useful fat-producing foods. The body regulators are those that contain salts and vitamins such as vegetables, fruits, and milk. The coarse foods, such as bran or cereals, promote peristalsis and thus aid in elimination.

A balanced diet is one that includes some article from each of the food groups listed on page 65, so that the body receives the necessary amount of starches and sugars, proteins, fats, mineral salts, and water. The importance of milk in a balanced diet should be clearly brought out, since it contains all the required food elements. Cellulose is necessary to proper digestion and natural peristalsis. This food element is found in grains and some vegetables, such as cabbage, celery, lettuce, and string beans.

In connection with the food instruction the teacher should present the fundamental principles of digestion and food preparation. A short outline of the digestive system should be presented to the pupils in a simple fashion (see Chapter VII). The action of the gastric juice can be easily demonstrated by preparing four test tubes—one containing pure water; the second, a 2 per cent solution of hydrochloric acid; the third, a solution of pepsin (gastric enzyme extracted from the stomach of a calf, to be bought at any drug store); and the fourth a solution of both acid and pepsin. If a piece of meat be placed in each of these tubes and set for half an hour in a warm place, the meat in the first three tubes will remain practically unchanged, while in the fourth tube the meat will begin to dissolve, becoming soft and slimy and coloring the whole of the liquid above with its dissolved products. The children

should be taught that the digestive system must have regular rest in order that it may do its work efficiently. The fact should be emphasized that the work of the digestive organs is made easier by resting before and after eating, by maintaining a calm mind, and by engaging in interesting and friendly conversation at the table.

As part of the usual food program, put before the class the proper preparation of foods. Stress again and again the three C's in food keeping: Clean, Cool, and Covered. Food that is carelessly handled is not clean. Fruits and vegetables that are eaten raw should always be washed. As part of the presentation of food keeping the bread mold experiment may be used, or a bit of meat exposed in order to show how it spoils and why. Simple home refrigeration methods may be discussed informally. The teacher may show how drying, preserving, and canning defeat the activities of the bacteria. Along with this, it is wise also to compare the relative food values of preserved and dried fruits with fresh vegetables and fruits.

Children of this group are curious and like to see things worked out before them. Inspection trips through dairies, bakeries, flour mills, and produce markets will be of interest to them. After such trips the children may be asked to submit written reports upon what they have seen and its importance in food economics. For example, a trip to the dairy may bring up discussions of methods of caring for milk and of distributing it, the number of dairies in the community, and what the state or city health regulations do to protect the milk supply. An interesting

experiment with milk can be carried out in the classroom. Milk may be separated into cream, curds, and whey, by first allowing the cream to rise and skimming it off, then permitting the milk to curdle, and separating the clot from the whey by putting it in a cheesecloth bag and letting it drip. Thus it may be shown that from milk come fat, protein, sugar, and water, the cream containing fat, the curd protein, and the whey containing fats, sugar, and water. This simple experiment will impress upon the pupils the many-sided food value of milk.

A resourceful teacher will find many ways of making her food instruction effective. Projects can be built about the history of foods, methods of food distribution, or modern commercial food storage systems. These projects are often linked up with the current events and history class by connecting them with such happenings as the famines in China or India or the failure of the rice crop in Japan. The following outline of a project that was actually carried out in a demonstration school will prove helpful. It shows how many points of interest for the child may be employed to strengthen his health instruction.

**The Food Project.**—

I. *Purpose*

1. The Teacher's

Realizing that "Child Food is Life Welfare" the teacher had as her purposeful activity the health of her pupils.

2. The Pupils'

The school lunch was selected by pupils as the meal to work on since it was the one they often bought for themselves and since

it was the one which seemed to puzzle mother the most. What is a good school lunch?

## II. *The Situation*

When the 4A pupils were measured and weighed and the results recorded on their health chart, some of the children found that they were underweight while a few found that they were overweight. This led to a discussion of reasons for these conditions and a desire to improve the records to be put on the chart the next month. The need of play, sleep, fresh air, and right food was brought out.

## III. *School Activities Arising from the Situation*

1. Discussion of Problems
   - *a.* Why we need food.
   - *b.* Kinds of food our bodies need.
   - *c.* What the underweight and the overweight child may need in the way of food.
   - *d.* Reading of books and food pamphlets to find out more about the above. Reports and discussion.
   - *e.* Discussion of food values found in foods reported by special groups. (Do these foods supply our bodies with all they need? Which of these furnish growing material?)
   - *f.* Review of the kinds of food our bodies need.
     - (*a*) Report of committee on *Diet for the School Child.* (A pamphlet by Lucy H. Gillett prepared for the Federal Bureau of Education.)
     - (*b*) Report of cafeteria groups. (Brief listing on board of classes of food and of foods reported by diet and cafeteria groups.)
   - *g.* Discussion of lunches with parents.

√ 2. Practical Applications
   - *a.* Visits of groups of children to cafeteria to secure lists of foods and prices.

*b.* Making together several menus. (Food values and costs borne in mind.)

*c.* Work decided upon for the next day, each child selecting one of the following as his contribution:

(1) Making a menu for a school lunch brought from home.

(2) Making a menu for a school lunch which can be bought at school.

(3) Making a menu for a school lunch part of which is brought from home and part of which is purchased from school cafeteria.

(4) Collecting appropriate food pictures and food advertisements found in magazines. (A valuable lead made use of geography.)

(5) Report of conversation with mother concerning the school lunch.

*d.* Well-balanced and appetizing lunches shown the class.

(1) A lunch brought from home.

(2) A tray from the school cafeteria.

(3) A combination home and cafeteria lunch.

*e.* Record kept of weights.

*f.* Carrying on of food habits.

(1) Eating the right kinds of food.

(2) Eating slowly and chewing well.

(3) Eating when rested and cheerful.

(4) Washing the hands before meals.

(5) Protecting foods from flies, dirt, and dust.

*g.* Reading of food pamphlets and books on hygiene.

*h.* Writing to Washington, D.C., for pamphlets of the *Health Education Series.*

*i.* A dialogue.

*j.* Food posters.

*k.* Original health rhymes.

*l.* Diet for the school child.

*m.* Weighing and checking up health charts.

*n.* Bringing flowers, mats, and paper napkins for the class table in the cafeteria.

IV. *Opportunities Which Presented Themselves*

1. Appeal to instincts and instinctive activities.
2. Formation of health habits of body and mind.
3. Social contact; coöperation and participation; initiative.
4. Skill in use of books.
5. Uplifting of standards.
6. Avenues of approach to geography, language, arithmetic, spelling, drawing, and other subjects of the curriculum.

√ **Bacteria and Their Work.**—Children in this group are mature enough to receive an introduction to the study of bacteria. In bringing the subject to the child for the first time, the teacher should be careful not to excite his fear. It is best to approach the subject from the constructive side by showing that there are bacteria most helpful to man. The part these tiny organisms play in enriching the soil, in nitrogen fixation, in the souring of milk, and in cheese making, and their tremendous benefits as scavengers should be presented in brief, interesting little stories. The action of fermentation bacteria can easily be indicated by permitting a little milk to sour, or by exposing a bit of bread to mold bacteria as already indicated. These two simple experiments will show the child how tiny but how important bacteria are. With a foundation of such positive value the teacher may then name a few of the germ diseases, such as colds and typhoid fever, giving the methods of fighting them outlined in Chapter XIII.

**The Bony System.**—In these grades it is too early for a detailed study of physiology, but the child should receive a foundation for his later physiological studies by having presented to him a few fundamental facts about his skeleton and its functions. First, the bony skeleton should be described as the framework of the body house, indicating briefly how certain portions are specially suited to their work. When this has been established, the skeletal system may be linked up with food instruction by showing that the bones require mineral matter for hardness and animal matter for toughness. If either of these are lacking, the bones are not able to perform their duties. Health rules for walking and sitting may be grouped around their effect on the bones. The child should learn to sit upright with the weight of the body on the thighs, with the feet firmly on the floor, toes fronting forward. In walking and running, illustrate the upright position of the body, toes pointing forward, and arms swinging naturally.

**The Motor System.**—After the skeleton has become familiar to the child, he may be led into a study of the motor system. Muscular machinery is different from other machinery in that the more it is used the better its condition becomes. Not only does a muscle grow with use but it also repairs itself, if it is furnished with proper foods. The very great part the muscles play in producing straight shoulders and an erect carriage of the head should be strongly emphasized. The class should know why the heart beat quickens and the respiration speeds up during exercise and what effect this produces in the body. They should know also the

importance of exercising in the fresh air. In connection with exercising, children should be taught to put on wraps immediately after exercising to avoid too rapid chilling (see Chapters VI and VIII).

**Organized Social Health Work.**—Patriotism and community pride begin to play a large part in the lives of children of this school age. The wise teacher will utilize these growing instincts in furthering the health work. Whenever the community puts on any organized health program, there is an opportunity to interest the child in it and to link up the public activity with the classroom discussion. Most communities organize yearly a campaign to eliminate the fly. While this is fresh in the child's mind is an excellent time to put on a campaign for the elimination of breeding places and the trapping of flies in the neighborhood of the school building. The life history of the fly should be discussed as well as its part in the spread of disease, and the best methods for fighting it in home and school. Usually the teacher may obtain fly posters from her local or state boards of health.

In communities subject to malaria the child should be interested in mosquito campaigns. He may be taught how the insect spreads the fever and how it breeds only in stagnant water. He will be delighted to empty old tin cans and to punch holes in them, so that they cannot become breeding places for mosquitoes. The use of oil on stagnant pools as a malaria preventive and such simple measures as the use of wire screens should be discussed.

The teacher should keep in touch with the monthly bulletins and other publications of the Department of

Public Health and the Board of Education regarding contagious diseases, impure water, and the like and discuss in the classroom such parts of them as may be within the comprehension of children.

Patriotic holidays may also be utilized to drive home interesting health habits as exemplified in the lives of Washington, Lee, Abraham Lincoln, and others.

In Washington's *Rules of Civility and Decent Behavior* are found the following suggestions which may interest the children in this group and appeal to their sense of humor.

> If you cough, sneeze, or yawn do it not loud but privately; and speak not in your yawning, but put your handkerchief or hand before your face and turn aside.
>
> . . . bedew no man's face with your spittle.
>
> Keep your nails clean and short, also your hands and teeth clean, yet without showing any great concern for them.
>
> Wear not your clothes, foul, unript, or dusty, but see they be brush'd once every day at least and take heed that you approach not to any uncleanness.
>
> Being set at meat scratch not, neither spit, cough, or blow your nose except there's a necessity for it.
>
> Cleanse not your teeth with the tablecloth, napkin, fork or knife, but if others do it let it be done with a toothpick.
>
> Be not angry at table whatever happens and if you have reason to be so, show it not. Put on a cheerful countenance especially if there be strangers for good humor makes one dish of meat a feast.[1]

[1] Washington's *Rules of Civility and Decent Behavior in Company and Conversation.* W. H. Morrison, Washington, D. C. 1888.

One of the dramatic leaders of modern times whose life inspires us with a feeling of admiration for the accomplishment of a single individual is Theodore Roosevelt. The record of his thrilling adventures and brave deeds includes no more heroic struggle than that for his own physical well-being. In his noble fight against the enemies of health, his faith, courage, and determination to do everything to make himself strong and well achieved a triumph that is worthy of our admiration. He was a frail, delicate baby; a sick, nervous, timid child; but at the age of eighteen he entered Harvard and was able to take part in all the activities of the college life and was graduated when he was twenty-one "a fairly robust man." "I made my health what it is," he said

**First Aid Instruction.**—Children in this group are ready to receive detailed first aid instruction for treatment of cuts and bruises, deep wounds, burns, fires, poisons, dog bites, drowning, and the carrying of injured persons. (For suggestions see Chapter XVII of this book and the Red Cross First Aid Manual.) Much of this first aid instruction is given as a part of the regular training in the Boy Scout, Girl Scout, and Camp Fire Girl organizations. Wherever possible, the wise teacher will link up her teaching with the instruction given by these organizations.

**Physical Activities.**—The physical activities of this group should show gradual progression over those of the preceding group. In the upper grades it may be necessary in some instances to segregate the sexes. The children are capable of participating in more highly organized team games—running, jumping, and

relays. Descriptions of physical activities for this group will be found in Chapter XXIV. Progress should be made by the pupils in muscular coördination, skill and grace of performance, initiative, sportsmanship, and student leadership. There should be a more conscious connection between the formation of health habits, the development of physical well-being, and the physical activities.

### Topics for Investigation and Discussion

1. Necessity for review of previous health rules.
2. Progressive formation of new habits.
3. The use of textbooks on health in the fourth, fifth, and sixth grades.
4. Projects that may be used in teaching food values.
5. Instincts of this group that may be used in developing health work.
6. The relation of school health work to the activities of such organizations as the Boy Scouts.

# CHAPTER XXI

## COURSE OF STUDY FOR GROUP THREE—SEVENTH, EIGHTH, AND NINTH GRADES, AND JUNIOR AND SENIOR HIGH SCHOOLS

When a pupil reaches the end of the elementary course he should have formed habits of cleanliness and healthful living. By the time he enters high school he should have a knowledge of the main facts of the structure and functions of the body, the conditions necessary to keep it in good working order, the nature and value of foods, the processes of infection, and the safeguards to be employed against communicable disease. With his developing social sense he should be grounded in the need of self-control, his duty to his associates, and a knowledge of and coöperation with the health agencies employed by the local community, state, and nation. The health work in Group Three should emphasize the social and community aspects of health, the scientific foundation for health habits, and the close union of health with organized group activities. Before beginning work on the program for this group the teacher should review all previous work.

**Health the Unifying Principle.**—Health is not a problem set apart by itself; it is closely interwoven with all aspects of life. The best way to present physical education to children is to link up health with

all of their other school activities. The departmental work of the high school has many decided advantages, but it has this great weakness—it tends to teach the child to regard the school subjects as utterly distinct. Life is not so organized, and if the child is to be truly educated he must realize clearly that all his classes are related. One opportunity for relating the school subjects is health instruction, since the question of health enters into so many phases of life.

The wise teacher realizes this and endeavors to plan her health instruction so that it will be presented to the child in as many different ways as possible. History and health can be related by encouraging the children to make a study of health conditions among the ancient Greeks and Romans. They may work out health projects in tracing the living conditions in the days of the Pilgrim or in Colonial Virginia. The great plagues of the Middle Ages naturally suggest discussions of the spread of disease, germ theories, and public sanitation. Sanitation in ancient times may be compared with modern municipal sanitation. As part of the history course classes may be encouraged to trace the historic effects of the diet and living habits of certain races. Athletics in present and past times furnish material for discussion, debate, and class papers.

Similarly, it is easy to tie up health with the work in sewing classes. For example, the first lesson in sewing may be utilized to illustrate the care of the eyes and hands, drill in posture, and the necessity of keeping needles and thread out of the mouth. A short talk on the evils of a cramped, bent-over position illustrated by charts and posters makes a good beginning. Whenever

the teacher notices bad sitting habits, she may use this violation as an opportunity for review in correct habits of posture. If the sewing period is long, the girls may become tired of sitting. In such case the sewing teacher may give a few words on the benefits of deep breathing, fresh air, and relaxing exercises, illustrating her point by having the class go through simple breathing and muscle resting exercises with the windows properly opened. The girls may be taught how to sit so that the light may fall upon their work properly. To relieve eyestrain induced by close work the sewers may be encouraged to take occasional glances out of the window to rest their eyes by looking at distant objects.

Clean hands are a hobby with every sewing teacher. One resourceful teacher used pictures illustrating the care of the hands together with sample packages of nail polish and orange-wood sticks. With these concrete helps it was easy to teach her class not only the necessity for keeping the hands clean while sewing, but also the value of clean hands in preventing disease transmission, and increasing personal charm. The sewing period may also be made a period for teaching health through instruction in correct clothing.

Cooking classes offer excellent opportunities, not only for the teaching of habits of cleanliness but also for instruction in food values, balanced diets, and the function of helpful bacteria in human life. Cooking classes are sometimes taken on excursions to bakeries, storage plants, and meat-packing establishments.

**Independent Investigation and Use of Textbooks.**—Children of this group should have textbooks in their hands and should be taught how to use them intel-

ligently. They should be referred constantly to health books in the school library. Newspapers and current magazines can be used for modern trends of opinion and practice, but these should not be taken too seriously as sources of scientific information. The pupils should be taught to read critically and to sift from the books and magazines what has been tried out and found reliable from what is mere propaganda or advertising.

In working out projects, debates, and prepared papers much use should be made of the health bulletins published by various health organizations, national, state, and local. The children may write to the proper officials for copies of such works and learn how to use them (see pages 344–346). After these bulletins have been used by the students obtaining them, they should be filed in the library for future reference. In some cases children may visit their health officers and secure material needed for working out projects.

**Use of Science in Teaching Health.**—Students in the junior and senior high schools begin the study of the biological and physical sciences. Perhaps no subject offers more points of contact with health and health problems than biology. The life histories of growing plants or animals may be used to stress the value of environment, the need for proper food, sunlight, and air. In the biological laboratory the life of the mosquito or the fly is usually studied in some detail. Such study may easily form the basis for discussion of fly-borne diseases, malaria, and yellow fever. Biology may also be employed to teach antisepsis and immunization, both natural and acquired.

Children respond strongly to tales of heroism and

of moral courage. The wise health teacher will use this interest and the child's response to self-denial, altruism, and courage by developing an appreciation of the work and achievements of distinguished workers in the health field. Short sketches of the lives of Pasteur, Jenner, Gorgas, Koch, Lister, Florence Nightingale, and Clara Barton will not only furnish inspiration but give opportunity for presenting many valuable health principles. The birthdays of such men and women of science offer opportunities for the use of this material. The following calendar will be helpful:

| | |
|---|---|
| April 5, 1827 | Lister |
| May 15, 1820 | Florence Nightingale ✓ |
| May 17, 1749 | Jenner |
| Sept. 13, 1851 | Reed |
| Oct. 3, 1854 | Gorgas |
| Oct. 5, 1848 | Trudeau |
| Dec. 11, 1843 | Koch |
| Dec. 25, 1821 | Clara Barton |
| Dec. 27, 1822 | Pasteur |

**Suggested Problems and Projects.**—The children of this group can enjoy working out problems, projects, and schoolroom debates on matters of health and its preservation and should be encouraged to do as much outside reading and independent investigation as possible. While the textbook will naturally form the basis for the work, other texts and bulletins should be put at the pupils' disposal after they have been taught how to use them.

In a graded high school the home economics class worked out a successful lecture project. The twelve girls of the class divided themselves into six teams of

two members each. One member of the team was appointed lecturer and the other critic. One day each week, in a ten-minute period before the noon recess, these girls visited every classroom in the school. The lecturers talked upon some specified health topic—the general health rules, care of teeth, regularity in eating, regularity in sleeping, and brushing the teeth—while the critics took notes on the success with which the lecturers made their points. Each lecturer gave the children an opportunity to ask questions. The subject of the talks was changed each week, and in this way all the children of the school had their attention directed to the same health habit on the same day and were free to discuss it among themselves during the recess.

**The Motor System.**—As a foundation for work on the muscle-bone system the main facts of structure; correct posture for sitting, standing, and walking; the care of the hands and feet should be reviewed. Debates on the following subjects will stimulate independent thought on the part of the pupil and require him to do outside reading in the fields mentioned.

Resolved that one year's athletic training be required for graduation from this school.

Resolved that classroom credit be given every student making any school athletic team.

Resolved that first aid training should be compulsory in high schools.

As part of the project work the teacher may form committees to visit various classrooms in the school to report upon the conditions in such rooms as affecting the posture of the pupils. The class may be asked to

outline for use by the Boy Scouts, the Girl Scouts, or the Camp Fire Girls a series of exercises for building up muscles or devise new exercises of their own for such purposes.

**Digestive System.**—The digestive system, the necessity for a balanced diet, and the elements necessary for such a diet should be reviewed.

*Projects.*—Projects will naturally grow out of topics dealing with food, milk, and water supplies. A school committee may be formed to study the source of the water supply and methods of distribution within the school building, and to make recommendations for installation of hygienic drinking systems, or the use and care of individual drinking cups, where hygienic fountains are impossible.

This project may be widened to take in a detailed study of the city's water supply; its sources; its methods of purification. If such a project is taken up, the teacher can vitalize it by arranging excursions to the local pumping stations and water bureaus. Preparation should be made for such excursions by advising the children what special points to consider during their visit and how to handle note taking. A further application of this project may involve the study of typhoid and water-borne diseases. Much material on this subject is usually obtainable upon request to local health authorities.

The teaching of food hygiene can be tied up with home economics. The teacher may appoint a committee to inspect the cooking class and report their observations as to sanitary measures observed, whether or not cooking pupils receive instruction in food values

and balanced diet. Students may be asked to make a report on their own dietary habits and to check up on the amount of food, milk, water consumed per day, whether or not their diets contain a proper proportion of carbohydrates, proteins, fats, and mineral salts. Health classes may be asked to prepare balanced menus for breakfast, lunch, and dinner.

An interesting project may be based upon a study of Pure Food Laws, both state and national, their history, their need, their advantages, needed extensions. This may be vitalized by excursions to meat packing establishments or cold storage plants, to see the laws in actual operation.

Chemistry and food may be linked up by studies of yeast, fermentation, bakery processes, as illustrated in the laboratory and emphasized by classroom teaching.

In the biology laboratory, the values of a balanced diet can be taught by encouraging the children to grow a series of plants, feeding each a different food, and checking results to prove the value of proper feeding. The hygiene of nutrition may be correlated with arithmetic by computing the actual calorie yield obtained from various weighed dishes served in the school lunch.

*Excursions.*—Food sanitation, food handling, and marketing procedure may be emphasized by having the school children visit and report upon local markets, wholesale provision dealers, and grocery stores. The children may report upon sources of local food supply, its local or foreign origin; influence of seasonal changes; and methods of storing foods.

*Debates and Discussions.*—Among subjects for debates are the following.

Resolved that the city should furnish each school child one-half pint of milk at each morning recess.

Resolved that vegetable food is more valuable than animal food.

Resolved that the city, town, or village should appoint a market inspector.

Resolved that our community permit only pasteurized milk to be sold in its stores.

Resolved that the state extend its inspection of dairy herds.

Resolved that public opinion be educated to demand more rigid sanitary inspection and operation of its waterworks department.

The need or the value of appointment of market and dairy inspectors as matter of abstract theory is not strictly debatable, none the less not all communities actually have them. These subjects were included here so that, if a given local community had no such inspectors, the discussion and the very weakness of the negative position might lead to the appointment of the necessary officials.

**Respiratory System.**—Review main facts of structure, stressing the fact that all cells depend on oxygen. Also review ventilation and tuberculosis instruction.

*Use of Pupil Committees.*—The teacher may appoint a committee on ventilation to study the ventilating needs of the classroom, and to be responsible for keeping the temperature of the room regulated and the windows properly opened to obtain change of air without draughts. The standard requirements for ventilation should be discussed (see Chapter VIII). This committee of inspection and report may extend its work to embrace the ventilating and heating system of the school as a whole.

*Projects.*—Special projects may take up a study of all local and state measures to prevent spitting in public

places. One project might consider the history of anti-spitting measures, the reason and need for them, how enforced, whether more rigid laws are needed, how the laws are posted, and the diseases most often spread by indiscriminate spitting. Another project may be built upon tuberculosis and its effects by studying what is being done by the state to fight it, in what occupations it is most prevalent and why, what school children can do to aid in the campaign. Interesting bulletin and poster material is usually obtainable from state boards of health upon request from teacher or pupil.

*Excursions.*—Visits to open-air schools, tuberculosis exhibits, or smoke and dust prevention congresses may be arranged and used to stress the relationship of air-borne diseases, smoke nuisances, and dust campaigns to health and health preservation. Children of high school age may be taken to tuberculosis meetings and exhibits, if they are stimulating and encouraging in tone rather than morbidly disheartening. The teacher may discuss the state, county, or city work upon the tuberculosis problem, the sanatoria, where located and how operated. Poster and booklet material can easily be obtained upon request to proper health officers.

*Debates and Discussions.*—Good subjects for debates or papers are:

Should public spitting be punished by fine or jail imprisonment?

What smoke and anti-dust ordinances are needed in our community.

How factories fight the dust evil.

The compulsory treatment, at state expense, of all tubercular patients.

**The Circulatory System.**—As the basis for advanced work, the teacher will first review the circulatory system and the part the red and white corpuscles play in the human economy. The blood stream as the transporter of food and oxygen to the cells and the wastes which are to be thrown from body by kidney and skin should be stressed. With the place of the heart and blood in maintaining health clearly presented, the class may take up projects and arguments.

*Projects.*—The treatment of persons suffering from cut veins or arteries may be illustrated by having one pupil act as patient and another as operator, the remainder of the class to act as critics or to write out discussions of the reasons for the first aid steps shown. Resuscitation of drowned persons may be taught in the same manner. If there are Boy Scouts in the class they will be eager to demonstrate what they have learned in Scout meetings. Projects may be based upon the study of the effects of alcohol and tobacco upon the blood, heart, and arteries, the pupil in each case to be encouraged to do independent reading and report. One of the most fascinating chapters in modern science is the history of the discovery, manufacture, and use of antitoxins in the war on disease. Classes may be asked to gather material on the lives of Jenner and Pasteur and to report in talks or written articles, or to investigate the modern methods of preparing vaccines and sera. In this connection care should be taken not to overstress the morbid side of bacteriology. Constructive aspects and the necessity for knowing the effects of bacteria in order to fight for health preservation should be emphasized.

*Excursions.*—Occasionally gymnasiums and swimming pools give free instruction in swimming and resuscitation methods. Whenever possible, pupils should be encouraged to attend such lectures and demonstrations. The Boy Scouts do much work in resuscitation and proper handling of wounds. A simple request will often permit a teacher and her class to be present at a Scout examination in these teachings. Sometimes, a troop will gladly demonstrate resuscitation at an assembly meeting of the entire school.

*Debates.*—For debates or informal classroom discussion the teacher may use such topics as:

Resolved that typhoid inoculation should be compulsory.

Resolved that every high-school pupil be required to prove his ability to render first aid to drowned persons before he may receive his diploma of graduation.

Resolved that the state or city supply to its citizens free of charge all antitoxins necessary to fight communicable diseases.

**The Excretory System.**—The main facts of structure and functions of liver, kidney, skin, lungs, and intestines should be reviewed. Along with this should go a review of bathing in its relation to health and the necessity for regular evacuation of the bowels. The use of food as a bowel regulator should be reviewed.

*Projects.*—Naturally, the use of projects in teaching the excretory system will group themselves about public sanitation, garbage and refuse disposal, and the application of the principles of the excretory system to use in the outside world. A city yard, a farm, and a town as a whole may be contrasted and compared as to the accumulation and disposal of waste. The class

may outline the work done by the garbage- and refuse-collecting systems of the community. A committee may be appointed to visit and report upon city dumps, their locations, and methods for improvement. Another may study the sewerage problem of the community and report upon it.

Surveys of home and town may be made to determine what steps are being taken in the war on flies and mosquitoes. The study of disinfectants and their proper use may be undertaken here. A committee from the class may study and report upon the sanitary methods used in the handling of the milk supply. Another may study public and private responsibility for quarantine of communicable diseases.

*Excursions.*—It may be possible for the class to visit the local incinerator where garbage is burned. Visits to city dumps or to the streams used as sewer outlets can be arranged and be made the basis for interesting talks on the sanitary disposition of a community's waste.

**Nervous System.**—The nervous system, the effect of alcohol, tea, and coffee, and the influence of drugs should be taught. The function of the nervous system in relation to body control, circulation, respiration, digestion, secretions, and sense of bodily well-being should be stressed. The development of habit and the part the nervous system plays therein may be traced. Along with the nervous system the sense organs—eye, ear, nose—their functions and care may be reviewed. The importance of proper lighting; eye-strain, causes and effects; removal of foreign particles; and general hygiene should be stressed.

*Projects.*—In connection with the nervous system, the teacher may ask for independent reading on the effect of tobacco and drugs on the nerves. The pupil may also be encouraged to study habit formations to show how they arise and function, the value of habit, how to form good and break bad habits, what are good health habits, and methods for practicing good health habits.

A committee may be formed to study fatigue in the classroom, whether it is due to poor posture, unsuitable desks, bad lighting and eyestrain, or to bad home health habits. Another may study fatigue in its relation to work, sleep, and rest, and the formation of fatigue poisons in the blood and the effect of fatigue on heart, nerves, and brain. Recent experiments with fatigue in animals will prove a rich field of study and a good device for interesting children in this important topic. Children may be encouraged to study fatigue and its importance in forcing such social legislation as the eight-hour day for locomotive engineers, providing rest rooms and stools for women in certain branches of industry, and the prohibition of night work for women and children.

A project may be built about the patent medicine question. How much do people of the United States spend each year in patent nostrums? How might this sum be more profitably spent? Medicine advertisements and labels from patent medicine may be collected and studied to determine which are possibly true and which obviously false. Do patent medicines encourage formation of drug habits? How shall we fight the patent medicine evil?

*Debates and Discussion.*—The whole question of social legislation for women, children, and men in dangerous trades offers almost unlimited material for classroom discussion and debate. Topics for discussion may include:

The prohibition of child labor in cotton mills and mines.

The legal requirement that restrooms equipped with comfortable chairs and cots be provided in every factory employing women.

The law requiring safety devices for certain machines.

The social justification for anti-narcotic laws.

*Excursions.*—Whenever possible, a visit to the restroom of some large factory should be arranged for study of its relation to increased efficiency by lowering fatigue. In lieu of this, the class may visit and study community recreational centers provided by private corporations for use of their employees.

**Reproductive System.**—Teachers should exercise judgment and tact in teaching this system, especially to the children in the lower grades of this group. Most of the work should be done individually and naturally, as the occasion arises and as the pupils' advance in science and history permits. The major portion of such instruction may be given only after there has been some grounding of the child in the fundamentals of biology. A study of a few simple plants will indicate the function of sex and the necessity for fertilization in all higher forms of life. By tracing the growth of seeds into new plants, the teacher may apply the principles of new life to animals and man without shock to the pupil. Discussion of the hybridization of plants will prepare the way for discussions of heredity and

environment. In the main, however, this work should be closely linked with instruction in biology. The science instructor may coöperate in health teaching by including elementary instruction in human reproduction at proper places in his courses.

**First Aid.**—First aid subject matter is best introduced, not as a separate part of the health instruction, but as a vital part of the study of circulation, respiration, etc. Consequently, bandaging should be made part of the study of the blood, and resuscitation of drowning persons, part of the study of respiration.

**Health Organizations.**—The importance of the local, state, and national health organizations and the need for coöperation with them should always be stressed. The child should be taught to use these organizations by having him write for bulletins sent out by them, using their publicity material, and attending any exhibit they may place in the community. Projects may be built upon these health organizations by having the children study the organization of their department of health, how its members are chosen and their duties. The activities of such health organizations may be studied, and the class may list various types of work, suggest how the work may be rendered more direct, and design posters for exhibits and campaigns. In every way possible the child should be led to coöperate with all health agencies and to realize fully his social obligation to keep himself healthy so that he will not be a source of danger to himself or to his community.

*Debates and Discussions.*—The Panama Canal may be used as the basis for papers or debates on the influ-

ence of sanitation upon world history. The post-war plagues of Europe may form a basis for emphasizing the vital need of sanitation. A debate on Russia and sanitation may stimulate original reading and thought if the class be formed into a number of committees, one to report on typhus, another on the malarial sections of the Soviet Republic, and others on the lack of health regulations and the breakdown of sanitation in cities. Current periodicals supply valuable information for this study.

The Junior Red Cross is organized for the participation of the child in community efforts for health. It is a branch of the American Red Cross and was formed to give children an opportunity to put into practice their own ideas and ideals for health; to encourage children to form sound health habits; to place upon them responsibility for their own conduct; and to assist teachers in their healthwork. The Junior Red Cross is a real instrument for peace and the promotion of international good will, for it coöperates with international, national, and local boards of health to bring about a coördination of all the groups working for the common end. Under its direction, the members enter into friendly correspondence with school children of other nations and thereby form contacts with other modes of thought, and unite in a coöperative endeavor for the promotion of a social goal of the first importance. Membership in the Junior Red Cross is not limited. A teacher may form a local chapter in her school and affiliate it with the national organization. The aims of the society, the method of forming local chapters, and teaching helps, are fully outlined in the pamphlets

that a request to the local chapter of the Red Cross will bring.

**Physical Activities.**—In the upper grades of the grammar school and in the junior and senior high schools the physical activities naturally group themselves around school athletics. For this group, then, athletic training rules and health habits are identical, and the teacher should stress their mutual interdependence.

*Sleep.*—The athlete requires at least eight hours of sleep each night, if he is to give his muscles and body proper rest. His bed should be comfortable, the covers light, the room cool and ventilated. Where possible, sleep should be followed by a cold bath and a brisk rub to secure maximum efficiency of the heat-regulating mechanism of the body.

*Smoking.*—A real athlete must not smoke. Too many smokers "crack" when the race is hardest or the contest most severe.

*Food.*—Few things are more important to the athlete than food. The athlete may eat any of the elements of a proper diet—soups, meats, eggs, vegetables, fruits, pure candy, and custards—provided he balances them. The meals on the day of the game or athletic contest are very important. Through ignorance of what to eat on the day of a contest, many coaches and athletes lose in performance what has been gained through long practice and conscientious observance of training rules. On the day of class contests, or games, the breakfast should be the hearty meal. Light food should be eaten for lunch, which should precede the contest by at least two hours and preferably three. A

safe and sane lunch three hours before the meet consists of one piece of toast, one poached or soft boiled egg, one small boiled or baked potato, and one glass of water.

*Drinking Water.*—An athlete must drink plenty of water. Water with meals is advisable provided it is not used to wash down food. Drinking ice water is not a good practice, especially immediately after a contest, and one should refrain from drinking water during the contest itself. This fact accounts for an athlete's practice of rinsing out the mouth instead of drinking during a game. The athlete should accustom himself to the drinking of water or milk rather than tea or coffee.

### Topics for Investigation and Discussion

1. Health as a unifying principle for the work of this group.
2. The value of the study of the lives of the heroes and heroines of health.
3. The need for the coöperation of all citizens with health agencies.
4. Problems in the lives of the children that may be used for teaching health.

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# CHAPTER XXII

## THE DAILY PROGRAM

**The Place of the Program.**—The course of study outlined in preceding chapters is valueless unless it is applied concretely in meeting the needs of the children as they arise. This can be done to best advantage by building up a well-balanced program which makes provision for each element to be taught and for the wise distribution of time. Though a program is essential, we must remember always to keep it as flexible as possible, so that we may vary it as conditions in and out of the schoolroom may make necessary. Moreover, the teacher who has an awakened health consciousness will find throughout the day suitable classroom situations for driving home health lessons. She should be quick to seize these at all times whether or not they fit absolutely into her prearranged schedule. In many of our schools conditions are far from ideal for the teaching of health, and in some it may be impossible for the teacher to uphold the standards that she believes desirable. In such cases she will do the best she can, receiving satisfaction in marking progress made and in solving her difficulties as far as she is able. Let her put in force such approved methods as may be possible and, these once under way, she may use her own judgment in improving existing circumstances or outlining

a new program to cover them. That the teacher may have some assistance in working out her own special problems we include an outline of four daily programs that have been applied in health teaching and have brought excellent results under conditions that vary from the most discouraging to the most stimulating.

**Program of One-Room Country School.**—Health consciousness has been so universally aroused that even under the most deplorable conditions for teaching we find efforts at inculcating health habits. A teacher of a one-room country school has most unfavorable conditions to meet, but with a little tact and study she will find it possible to stress the few fundamental health habits. The following program is one which was developed by the teacher of a one-room country school that enrolled thirty children in five grades. The teacher, assisted by a nurse, made an annual physical inspection of her children in regard to vision, hearing, mouth breathing, teeth, and tonsils. Once a year also there was a careful weighing and measuring of all her pupils.

(1) *The Morning Period.*—The day opened with daily inspection for personal cleanliness and symptoms of disease. An occasional morning talk was given on some health topic. Once a month, sometimes oftener, the language period in different groups was used for description of games and the stressing of health habits. During the morning this teacher provided ten-minute physical exercises in addition to the ten-minute recess from ten-twenty to ten-thirty.

(2) *The Lunch Period.*—The lunch period came from twelve to twelve-forty. In preparation for this,

the children poured water over their hands and dried them on individual towels, which they hung on nails driven in the side of the schoolroom.

(3) *The Afternoon Period.*—The afternoon recess, which came from two-twenty to two-thirty, provided opportunity for physical activity. In addition to this recess, a second ten-minute period was used for physical exercises. School was dismissed at three-thirty.

(4) *General Health Principles.*—Drinking water had to be brought from a spring a quarter of a mile away. In connection with the water supply the teacher worked in health principles by stressing the need for sanitary source of supply, proper storage, and individual drinking cups. The drinking water for this school was kept in a cooler, and the children brought individual cups which included jelly glasses and tin cans. The children were taught to keep these clean and were provided with a shelf upon which to store them. The teacher watched her ventilation carefully and provided a supply of fresh air by proper opening of the windows. The heat question was more difficult since the stove was in the center of the room, but she regulated the temperature as well as she could. In her teaching she followed the suggested projects and problems outlined in her State Course of Study. With almost no equipment, she obtained good results and a high percentage of attendance. There was very little sickness among her pupils.

**The Small-Town School.**—Conditions in a small-town school are usually more favorable for health instruction than in the rural sections. There is apt to be more equipment available, better planned and

arranged classrooms, and opportunities for working out projects and excursions with health objectives.

(1) *Before Class Opens.*—On her arrival at school, one of the teacher's first concerns should be the matter of temperature. A thermometer should be part of the equipment of every schoolroom, and the temperature of the room should be maintained as close to 68 degrees as possible. If the room is too warm, she should lower the windows, or if too cool, regulate the heat to bring the room temperature to normal. Either she or a committee of pupils appointed for the purpose should see that the window shades are properly adjusted each morning before class opens.

(2) *Roll Call and Inspection.*—The morning should open with daily inspection for cleanliness and symptoms of communicable disease. Every child without a clean handkerchief should be provided with a square of cheesecloth or a paper napkin. In the higher grades and with older pupils part of this morning inspection may be left in the hands of the children themselves. The daily roll call will often reveal absences which may be used as a basis for discussion of their causes. Absence usually is due to preventable sickness, and absence discussion may consider methods of preventing the spread of disease if the absent pupil be suffering from a communicable infection.

(3) *The Water Supply.*—At the beginning of the school term the teacher will make sure that the water supply is pure. The older children can be interested in having the school water supply tested through the state department of health. The teacher, or a committee appointed by her, should inspect the condition

of the drinking fountains at regular intervals. If fountains are not provided, the teacher may inspect the drinking cups and see that they are arranged in orderly condition and in the proper place. Some teachers use shelves with the children's names under the cups.

(4) *Coördination of Health Instruction with Other Subjects.*—The alert teacher will always seize every available opportunity for driving home health instruction. One enthusiastic teacher employed the account of a child's breakfast that was found in the story for the reading lesson to teach the need of a balanced meal and the elements that make it up. History frequently offers opportunities for bringing in some needed health lessons. Even arithmetic may be utilized, as when the children are asked to compute the calorific value of various foods, as for example in three-quarters of a pound of beef, or in four dozen eggs.

(5) *The Lunch Period.*—At lunch period the children should have the proper facilities and a time for washing their hands before eating. One successful teacher had her pupils hang their towels on hooks with their names above them. (With children too small to read the hooks were identified with pictures pasted above.) At the beginning of recess time the children marched by, took down their towels, and went out into the hall to a basin where they washed their hands in turn. Afterward they marched back, replaced their towels on the hooks, and then took down their lunch boxes, which were arranged on a shelf. These they took to their seats, where they were required to sit at least ten minutes. During this period they quietly

ate their lunch. Afterward they replaced their lunch boxes on the shelf and went out to the playground for the play period.

(6) *Physical Activities.*—The well-balanced daily program will be planned so that the children will not be kept seated too long or at work which requires reading or writing steadily for a protracted time. Between classes informal physical exercises may be provided.

Where possible, the teacher will supervise and take part in the games played during the recess period. This will benefit her as well as the children.

(7) *General Considerations.*—Health stories, plays, posters, scrapbooks, rhymes, songs, and competitions are helpful for all teachers, but their use does not necessarily mean good health teaching. The wise teacher will not overwork any topic even so important as milk. If milk is taught all day long, through conscious planning of stories, charts, and lengthy talks, the children are disgusted with the thought of it. All depends upon the discretion of the teacher in using the materials that are available. The best plan can be killed by a teacher who antagonizes her group and forces upon unwilling pupils a subject in which their interest has not been sufficiently aroused or by placing upon it undue emphasis.

The grouping of children according to their physical and mental ability has a decided influence upon their development and requires judgment and study on the teacher's part. Promotion and grading on reports have a very definite bearing on the children's health. To hold back a bright child often leads him to form bad mental habits of dawdling, day dreaming, undue

laxity; and the over-stimulation of a high-strung, nervous child, pushing him beyond his years may result in a serious breakdown, if not immediately, in later years. Serious consideration needs to be given to the home environment of the children and the conditions under which they are studying. Group conferences with mothers of the children of individual grades or personal conferences should be held in regard to the lighting and other conditions under which the children are working at home. The home environment should largely determine where the emphasis is placed in health instruction in the schools. Children who come from homes where cleanliness is taken for granted need very different instructions from those who have to be sent home to clean up. One of the most important phases of mental hygiene to be considered by the teacher is the creation of an atmosphere of coöperation and sympathetic understanding, which will aid the children in reducing the amount of friction to the minimum. An efficient teacher will attempt to grade her work for individual pupils so that they will not become discouraged and will not have as a part of their experience that hopeless sense of failure. At the same time she will help them in meeting bravely and fearlessly the unavoidable sorrows and defeats in their lives.

In selecting textbooks the teacher should consider whether they meet the standards in regard to type, size of page, length of line, and quality of paper.

**Program for First Grade in a Large City School.**— The following program of one day's work in the first grade of a city school is given here to show the oppor-

tunities which arise for the incidental teaching of health. The resourceful teacher will find it easy to adapt this to her own particular needs, and work in such hints for the teaching of health as may occur to her.

8:45–9:45 Preparatory period
- (1) Entrance. Coats, hats, and overshoes are removed, and each child hangs them on the peg specially assigned him in the cloakroom.
- (2) Daily inspection for clean hands, nails, teeth, skin, and clean handkerchief. Handkerchief drill to teach that mouths must be covered when one coughs or sneezes.
- (3) Free period.
- (4) Morning exercises. One health talk every ten days.
- (5) Rhythms—marching, skipping, music interpretation.
- (6) Teacher, with class, plans the work of the day.

9:45–10:45 } 2 groups } Reading by two different groups. Whenever possible the reading story is used to fortify a health principle; if a meal is described, children are asked what was eaten and why.

10:45–11:45 Recreation
- (1) Exercise—five minutes

  Preparation for recess { Toilet / Water / Washing hands
- (2) Lunch. Hands must be washed before eating. Kinds of food best for lunches. Too many sweets not healthful.

(3) Music.

11:45–1:10 2 groups } Second Reading Period

Correct reading habits stressed. Light must come from right direction; correct posture.

Phonics—ten minutes.

1:10–1:30 Dismissal

Just before dismissal the children straighten up room, and put away materials, so that the classroom may be left in order.

**An Informal Private School Program.**—In one private school, richly endowed and given to experiment, a very comprehensive program for health and physical instruction for its first grade has been worked out in considerable detail. This program is a very valuable one but is perhaps too detailed for use in the ordinary public school. Certain of its features, however, may easily be adapted to the need of any school and of any grade. Discussion of certain health topics, such as the importance of cleaning teeth and having windows open at night, are not presented directly to the children, as such matters are taken care of in the home. In the main essentials the program of this school is divided thus:

(1) *Arrival at School.*—Upon arrival at school the child is taught the care of wraps, how to keep them clean, how to hang them on their proper hooks in the cloakroom. The need for wearing rubbers, their care, and their proper placing in the cloakroom is also taught.

(2) *Activities of the Work Period.*—During the work period the child learns how to select a chair of the proper

height and to take a correct posture while at work. He is also taught to regulate clothing (taking off sweater when too warm), and to keep clothes clean by wearing an apron. Cleanliness is taught by stressing the importance of keeping fingers, hands, materials, and tools out of the mouth, and washing hands after using clay and paint. Correct reading habits—posture and lighting—are stressed, as is the need for alternation of rest and activity. As part of the incidental work the child is educated to avoid draughts, and not to make unnecessary noise. In the clean-up after activity, the pupils receive instruction in how to straighten up a classroom and to sweep without raising dust.

(3) *Activities of Music Period.*—This period gives opportunity for free, vigorous exercise. The child is taught to keep his mouth closed during exercise to develop proper nose breathing. He also learns how to relax when listening to music.

(4) *Group Habits.*—Whenever the children come together in groups they are taught not to sit too close to others and to keep their hands away from mouth and nose. The use of the handkerchief in coughing and sneezing also receives emphasis when the children are sitting in groups.

(5) *Lunch.*—The children receive instruction in the washing and drying of hands before eating and the setting of the table hygienically, without unnecessary handling of plates and dishes. They also receive instruction in the proper methods of eating and the kinds of food necessary to health. Lunch table conversation can be frequently used to induce children who do not

like cereals or vegetables to eat them. As part of the correct eating instruction the child learns the use of the water cooler, individual cups, and the value of drinking frequently. After lunch the child is taught to relax and to rest quietly for a short time.

(6) *Correct Toilet Habits.*—The children are carefully instructed in correct toilet habits, when to go to the toilet, proper care of person there, and the necessity of washing hands afterward.

(7) *Relaxation.*—As part of the relaxation instruction the children are taught to relax when listening to music. When they listen to stories or look at books they are taught how to sit to avoid facing the light, what proper posture is, and to turn the pages of books without moistening the fingers.

(8) *Attitude toward Pet Animals.*—The child is taught to feel some responsibility for his pets and how to care for them. Each child is assigned some task, such as proper feeding or the care of the cage. The habit of washing hands after handling pets or animals of any description is carefully stressed.

(9) *Outdoor Play.*—Responsibility for putting on rubbers and buttoning up coats before going out of doors is impressed upon the child. He is also trained to avoid overtaxing himself or becoming overheated and is taught to keep out of mud puddles.

(10) *Safety First Instruction.*—This subject is given great weight in this school because it is located in a large city where the child must early learn to care for himself. Safety first instruction is carried on throughout all periods. It may be grouped as follows:

*a.* The child is taught how to carry scissors, tools,

pencils, and the like so as to avoid injury to himself and others. He is taught how to use play apparatus.

*b. Fire Drill.*—The fire drill is dramatized frequently, and the child learns to leave the room quickly and in orderly fashion to avoid panic. He also is taught to appreciate the service of firemen.

*c. Excursions and Outdoor Play.*—The child is taught to walk, not run, in halls or on the stairs; to wait for the teacher when crossing the street; to watch for automobiles at crossings; and to know what to do if lost. Simple first aid instruction is given, and the child is taught to appreciate the service of policemen.

**Summary.**—From the illustrative programs given the teacher will see how natural it is to make health instruction an integral part of her daily teaching. She may work out for herself a program that will embody the best features of these plans and yet leave room for making such special applications as circumstances may dictate. It is to be remembered, however, that the formation of health habits in the student is the thing desired and not the working of an ideal program. Programs are means to ends not ends themselves. To achieve results some definite scheme is necessary, but this may be as informal as the teacher desires. It should not, however, be so informal that she cannot check up on results or know where her class stands.

### Topics for Investigation and Discussion

1. Health instruction an integral part of daily teaching.
2. The need for a definite health program in every class.
3. Difficulties that the teachers of the public schools have to face in developing adequate programs of health education.
4. Strongest points of the programs described in this chapter.

# CHAPTER XXIII

## POEMS, STORIES, AND DRAMATIZATIONS

**Use of Poems.**—Children of all ages are naturally interested in songs, poems, stories, and dramatizations, which can often be used most effectively in teaching health. The younger children delight in making original rhymes.

The Child Health Alphabet,[1] first published in 1918 by the Child Health Organization, and now to be obtained through The Macmillan Company, publishers, may prove suggestive as a model if read to the class or assigned as a text for the preparation of posters with original illustrations. The following are a few typical rhymes from the booklet:

A is for Apples
  And also for Air;
Children need both
  And we have them to spare.

C is for Cereals
  And Cocoa too;
Consider the calories
  Coming to you.

M is for Milk which
  Makes Muscle and Bone;
One quart a day
  Would be best till you're grown.

[1] Used by permission of The Macmillan Company, publishers.

S is important
And therefore I hope
You'll pardon my specially
Mentioning Soap.

Y is for You,
And I tell you the Truth,
Learn to be Healthy
And Strong in your Youth.

**Health Stories.**—Stories that lend themselves either to debate or to dramatization, or to both, will prove particularly effective. The following story of "The "Brushes' Quarrel"[1] has been extensively used for purposes of classroom discussion and as a basis for dramatization by the children themselves.

### The Brushes' Quarrel

Once upon a time a little girl thought she was waked up one night by a noise of voices in the kitchen. It seemed to her that she pushed the kitchen door open softly and that this was what she saw and heard.

The moonlight was shining quite brightly through the kitchen window, and sitting in a ring on the floor were all the brushes and brooms in the house. They were having a vigorous argument as to which one ought to be king. The broom was presiding at the meeting, because he was biggest; but it had been agreed that the one that was most useful in the household ought to be the king, and each was presenting arguments why he should be the one.

The hearthbrush declared that ashes from the fireplace made more dirt in the house than everything else put together, and that his work of keeping them back on the hearth and preventing them from being blown about was the most important thing a brush could possibly do.

[1] C.-E. A. Winslow. *Healthy Living, Book I.* Charles E. Merrill Co.

Mr. Broom, the chairman, put in his word. "There is nothing at all in the Hon. Mr. Hearthbrush's claim." (The broom was always very formal and polite.) "The open fires are only lighted in certain rooms and at certain times; but there is dirt in the house always and everywhere. I am the one who has to keep it clean from attic to cellar, in July as well as in January, and my work is therefore most important of all."

The bottle brush and the sink brush applauded this (by rubbing their bristles against each other); but the clothesbrush jumped into the center of the circle, very much excited, and gave the discussion a somewhat new direction. "It is true that Temporary Chairman Broom probably moves more dirt in a year than all the rest of us put together," he said, "but I claim it is quality of work, not quantity, that ought to count. Mr. Broom is trusted for the heavy work of cleaning floors and stairways, but when they want a really good job done, when they want the clothes they wear to be spic-and-span, they call on me."

"There is a great deal in what Brother Clothesbrush has said," interrupted a handsome silver-mounted hairbrush, "but his argument counts much more for me than it does for himself. The clothes are more important than the carpets, but the head is more important than the clothes, and I have by far the greatest work of all to do."

There was silence for a moment, and it almost looked as if the hairbrush would carry the day. Suddenly a tiny little figure ran out into the moonlight, and a high squeaky voice cried out, "Wait a bit, wait a bit, until you have heard a plea from me, the Toothbrush. The clothes are more important than the carpet, and the head than the clothes, I agree. But the inside of the head is far more important than the outside."

"If Mr. Clothesbrush or Mr. Hairbrush is neglected," he went on, "our masters and mistresses will look untidy, but they will not get ill; while if I were not used, there would be toothache and misery and illness as a result. I am the one who ought to be king of the brushes."

There was a great hubbub and noise, some taking little Mr. Toothbrush's side and some opposing him; but just then the dreamer woke up and never knew who was finally chosen king.

Children are usually more interested in having stories told them than in hearing them read, but one teacher held the attention of her group by pausing during the reading of a health story for the children to supply the facts of hygiene as they were needed to complete the thought.

Numerous health stories, well adapted to use in the classroom, may be obtained from the following sources.

*Child Health Alphabet*, *Cho-Cho and the Health Fairy*, *Rhymes of Cho-Cho's Grandma*, American Child Health Association publications, republished by The Macmillan Company, New York City.

*Course of Study in Hygiene*, State Department of Education, Columbus, Ohio, published by Ohio Public Health Association.

Dandsdill, T. *Health Training in Schools.* National Tuberculosis Association, 370 Seventh Avenue, New York City.

Hallock, G. T. and Winslow, C.-E. A. *The Land of Health.* Charles E. Merrill Company, New York City.

Winslow, C.-E. A. *Healthy Living, Book I.* Charles E. Merrill Company, New York City.

**Dramatization.**—In the lower grades, such imitative activities as warming the hands, climbing up-hill, picking apples, driving nails, whirling of leaves, and swaying of tree tops, appeal to the children, but pupils of all ages enjoy working out original dramatizations of stories, and in the advanced grades they like to plan original plays and pageants. These provide opportunity for the use of ritual, mystery, and parade.

Dramatics are being effectively used in the schools of Syracuse, New York, for teaching health. In one school the play "Mr. Cold, You Can't Catch Me," published in *Better Health*, produced good results.

While the plays that classes plan for themselves are of more educational value than those that are produced merely from memory, teachers often find plays that have been published suggestive in developing special ones with their own particular groups.

In a certain school, a given class was assigned to take charge of the assembly period on a specified day. The class decided it would entertain its schoolmates by presenting a play and asked the Director of the Health Crusade to suggest one suitable for their purpose. She gave them a copy of "Health Fairies." The play was carefully read and the interest of the children aroused. The class prepared to present it. In group discussions, the children decided on the characters needed, which pupils were best suited for each part, and the costumes required. These arrangements made, the class then took up the making of costumes, which the pupils designed and made with the coöperation of the home economics department of the school. Next, the class undertook the proper advertising of their play. For this campaign, the pupils made a series of posters. Not only did the pupils receive training in health principles and a real enjoyment in their work but they gained, as by-products of their acting, increased language ability, practice in costume design and making, the drawing of posters, and the practice in spelling and drawing that these exercises demanded.

The play presented in this instance is so admirably adapted to its pupose that it is reproduced herewith with the permission of the Richmond Tuberculosis Association.

## HEALTH FAIRIES

Arranged by Claire McCarthy, ................ Crusade Leader
(Richmond Tuberculosis Association)
Time required ............................... Thirty minutes

A play especially written to present to the public the ideals of the Modern Health Crusade. It can be seen that frequent use of the "Spirit of the Double Barred Cross," "The Champion" and "The Chore Card," has helped to make the play complete (Publications of National Tuberculosis Association).

This little play portrays to the public the benefits derived from good health habits. While entertaining with sprightly dances, the fairies in colorful costumes give the message to their audience that to be happy you must be healthy and that health and happiness can be obtained by a few simple little rules faithfully kept from day to day.

* * * * * * *

It will be seen that twenty-six characters are used, but that number can be increased or decreased according to the children available.

* * * * * * *

### *CURTAIN*

Stage Setting.—*Throne of the Queen of Good Health.*

*A low seat some distance from the throne for the Queen of the Milk Fairies to rest.*

*A seat for the Heralds to bring in, in the last part, for the Stranger.*

* * * * * * *

### *CHARACTERS AS THEY APPEAR IN ORDER*

Spirit of the Double Barred Cross
Stranger from Average Town
Soap
Water
Exercise
Fresh Air
Rest

GOOD FOODS

| | |
|---|---|
| Charlie Carrot | Fluffy Spinach |
| Cry Baby Onion | Pete Pea |
| Mickey Potato | Rosie Beet |

Cream of Wheat

THE MILK FAIRIES

| | |
|---|---|
| Queen of the Milk Fairies | Viola Vitamine |
| Fannie Fat | Minnie Mineral |
| Sallie Sugar | Patrick Protein |

FRUITS

| | | |
|---|---|---|
| Orange | Apple | Banana |

Neat Fairy
Heralds
Queen of Good Health

*As the curtain is drawn, the Spirit of the Double Barred Cross is seen arranging flowers about the Queen's throne. In a few seconds a little girl, poorly clad, appears; she seems to be quite overcome at the beauty of the place and in a rather excited tone inquires:*

Stranger — What place is this?

Spirit of Double Barred Cross — This is the throne of the Queen of Good Health. She is out in the garden with Exercise and Fresh Air; they are two of her fairies she loves to have with her.

Stranger — And who are you?

Spirit — The Spirit of the Double Barred Cross bids you welcome. Summoned by the cries of those who suffered from the dreadful plague, Tuberculosis, fairies with kindly hearts set forth upon a brave crusade. To spur them on and give them courage in their quest they

have the crimson sign, the Cross with the double bars. 'Twas thus that I was born.

STRANGER Has the Queen any more fairies?

SPIRIT Oh! yes, she has many more and if you want to be happy you must know them and keep them with you always.

STRANGER But can't I ever go home?

SPIRIT Oh! yes, if you promise to take the health fairies with you.

STRANGER But how shall I ever know them?

SPIRIT They are coming now; I will introduce them as they come in. (*Two children appear, both dressed in bath robes with a bath towel on one arm and carrying a bar of soap.*)

SPIRIT Here are Soap and Water.

SOAP Wash your hands before each meal. Wash your face, neck, and ears and clean your finger nails every day.

WATER Take a full bath at least once a week. Drink four glasses of water every day, some before each meal.

SPIRIT This is Exercise. (*Exercise is dressed in bloomers and middy and carries a tennis racket.*)

EXERCISE Take ten slow deep breaths of fresh air. (*Here she takes ten deep breaths.*) Play out of doors or with windows wide open more than thirty minutes. Try hard to sit and stand straight. (*The accompanist plays a few bars of Moszkowski's Sonata and the child does the setting-up exercise.*)

SPIRIT Here are Fresh Air and Rest. (*Fresh Air is dressed in a fairy costume and carries balloons.*

*Rest is dressed in pale blue pajamas, and carries a candle.)*

| | |
|---|---|
| FRESH AIR | Open windows while you sleep,<br>Will keep the roses in your cheek.<br>*(Fresh Air does a very pretty balloon dance to "Amaryllis" Rondo.)*[1] |
| REST | Sleep nine hours or more with windows wide open if you wish to be as healthy and happy as I am. |
| SPIRIT | Here come good foods. |

| | |
|---|---|
| Charlie Carrot | *(Carrot-colored cambric dress, with green paper cap.)* |
| Cry Baby Onion | *(Green dress with white top.)* |
| Mickey Potato | *(Brown dress and cap with black dots.)* |
| Fluffy Spinach | *(Green dress with green paper hat.)* |
| Pete Pea | *(Light green dress and cap.)* |
| Rosie Beet | *(Dark red dress and paper cap of green.)* |
| Cream of Wheat | *(Black bloomers with white cap and coat.)* |
| (Milk Fairies)<br>Fannie Fat<br>Sallie Sugar<br>Viola Vitamine<br>Minnie Mineral<br>Patrick Protein | *(All the Milk Fairies are dressed in white dresses, yellow capes, and yellow paper bonnets. They form a circle around the Queen of the Milk Fairies, who is a larger girl and dressed like the others.)* |

Here are the fruits.

| | |
|---|---|
| Orange<br>Apple<br>Banana | *(Dressed in orange color cambric with cap to match. Apple and Banana in their correct colors.)* |

[1] *Amaryllis*, a Rondo by SHYS. Published in sheet music by The Century Company.

STRANGER — But where are Tea and Coffee?

SPIRIT — Tea and Coffee? Why don't you know that Tea and Coffee are not good foods and that is why they cannot come to Fairyland? Be sure to eat your food fairies very slowly, because once upon a time I found a little girl from Average Town, who drank her Milk Fairies so fast that she drowned them. (*Here a pretty little fairy dressed in a fairy costume enters in a gay and playful manner.*) Here is the last of the Health Fairies, she is most helpful to all the others.

NEAT FAIRY — To be like me you must be neat, cheerful, straightforward, clean-minded, and protect others when you spit, cough, or sneeze. See how happy I am. (*This little fairy is a pretty toe dancer. She has for her selection "The Garden Dance." This music can be obtained from the Sam Fox Folio.*)
(*At the end of this dance trumpets are heard, the two Heralds enter dressed in Crusade capes, red bloomers, and white caps with red plumes, carrying trumpets.*)

HERALDS — Make way, make way; the Queen of Good Health comes. (*The Queen enters and ascends her throne, while all bend low in stately courtesy, except the little stranger, who is awed by the wonderful sight.*)

QUEEN — Who is this dirty little stranger?

SPIRIT — She is a little girl from Average Town who wants to be healthy.

QUEEN — Soap and Water! Take her out and bathe her in the pearly dew and teach her how to use a toothbrush. (*Soap and Water make a low

*bow to the Queen when they take the Stranger by the hand and go off the stage.*)

Exercise! When she has been made clean you see that she takes ten deep breaths of fresh air and plays the health games out in the open. (*Exercise bows low and exits.*)

Fresh Air and Rest! After her exercise, you see that she takes a nap with her windows wide open. (*They like the others make their exit.*)

Good Foods! (*All stand*). Nourish her with a glass of milk and brown bread and butter; the rest of you prepare for her dinner. (*The music plays and the children sing "If a Lassie or a Laddie"—words in Crusade Manual—while they heel and toe off the stage.—Music, "Coming Through the Rye."*)

Heralds! Prepare my court for the evening health games and stories, then invite the little Stranger in to see my fairies dance. (*The Heralds arrange a seat near the Queen for the Stranger, then they blow their trumpets to call the fairies who return, singing and dancing the same as when they danced off. The Heralds have gone to bring the Stranger. They escort her to the Queen's throne; she is much transformed; she is no longer a dirty little girl, but wears a lovely fairy costume.*)

Welcome, Stranger, to my court, have this seat near my throne. (*The Stranger bows low, then takes her seat.*)

Now for the fairy dances. (*Six of the fairies with different color scarfs trip to the center of the stage and dance the scarf dance—folk dance.*)

Now for the story of the "Milky Way." [1]

[1] *Queen of the Milk Fairies*, by Marion Phalam, United States Department of Agriculture.

## STORY TOLD BY THE QUEEN OF THE MILK FAIRIES

On clear nights, when the stars are more than usually bright, people look up and see a long, broad, snowy pathway which glows against the darker hue of the sky and then they say:

"How beautiful the Milky Way is tonight."

But few give it more than a passing thought, for few know that the Milky Way, which looks so like a long, milk-white cloud, is really thousands and thousands of little milk fairies flying about the skies. Not many persons have ever heard of the lovely Queen of the Milk Fairies, whose tears fall nightly in lingering dew drops on clover, violets, and grass, although all share her good works. The Queen dwells on one of these stars which sparkle brightly in the Milky Way, but just which one no human can know.

Many, many years ago, when the Queen was very young, a handsome prince lost his way amongst the stars and wandered by chance near the Queen's palace. Many princes had wooed the young Queen in vain, but as soon as her eyes fell upon the Prince she loved him. When he looked at her, clad all in snow white, with a wreath of white blossoms about her golden hair, he loved her madly. They were married, and the Prince came to live in the palace and became King. Two sons were born to the King and Queen, and they named them Prince Butter and Prince Cheese.

Surrounded by the beautiful court of the Milk Fairies, the royal family lived in great happiness. Every night the Milk Fairies gathered about them, dancing and sparkling and singing sprightly songs, and people on the earth looked up and remarked at the clearness of the Milky Way.

But on another star not so bright as that where the Queen of the Milk Fairies held her court, there lived a wicked old witch, who was jealous of the happiness of the royal family. They annoyed and fretted her. She said to her ugly daughters, "I will put an end to their eternal dancing and gaiety and their love for each other." She grumbled threateningly when the little Milk Fairies, singing their songs at night, flew near her star.

So she planned to put an end to their festivities. One day, when the Queen was away with her fairies, the wicked old witch stole upon

the King and in the wink of an eye, cast a spell upon him. She knew of course that, being a King, he could not die, but still she had the power to destroy the happiness of the royal family. When the Queen returned she found the young King lying motionless, as though he were dead. All the great fairies of the realm were called in to try their magic gifts, but all were powerless and the King remained in deep sleep.

The Queen and her sons wept bitterly. Nothing could make them happy, not even the songs of their subjects. But a bright little bird, who had often found rest and refreshment at the palace and who loved the Queen, had overheard the wicked old witch telling her ugly daughters the secret of the King's enchantment. He hurriedly flew to the weeping Queen, perched on her shoulder, shaking with sobs, and whispered; "O beautiful Queen, do all the good that you possibly can for mankind and in time your King will be restored to you."

So the Queen planned to do good for mankind through the thing over which she had the greatest power, MILK. "Every tear that I shed for him," she said, "shall be a drop of dew and that dew shall have magic power; flowers and grass and clover shall drink in the dew and the cows shall eat them and thus there will be magic power in the milk. Because of the love that I have for my little sons, the milk shall first of all benefit the children; it will make them grow, it will make them strong, it will give them white teeth and healthy bodies, it will be the most precious food in the world."

As the people of the earth drank more and more milk, the Queen began to be happier for she realized that the more milk that was used the more good she was doing mankind. This meant that the time was drawing nearer and nearer when the King would be restored to her.

* * * * * * *

STRANGER Good Queen and happy fairies, I pray thee let me express my thanks for all you have taught me. It is growing late and I must away to Average Town to teach my little playmates how to keep well.

QUEEN But, little Stranger, can you prove to my Health Fairies that you are ready to leave them?

STRANGER Oh! yes, Fair Queen. (*Here she repeats all the Crusade rules.*) So you see, Good Fairies, I can dance the fairy dances too. (*She dances "Basket of Roses."*)

QUEEN "Spirit of the Double Barred Cross," knight the little Stranger with the Modern Health Degree of Knight Banneret; then we will escort her to the edge of the earth.

SPIRIT. (*The Spirit summons the Stranger to the center of the stage where she kneels. The Spirit then puts the Crusader's cape and cap on her; she then touches her on the right shoulder with her sword, the cross with the double bar and says):*

Wherefore, O Mighty Modern Health Crusader, do I commission thee to lead earth's children in a crusade for health, by means of daily tasks, small in themselves, but mighty in their consequence; teach them their priceless birthright, perfect health, that life may fulfill itself for them, in sound strong bodies and joyous hearts.

QUEEN Rise, O Knight!
In days of Old, Crusaders bold
Rode forth to fight the foe,
And you today, as brave as they,
Forth to the battle go,
Let's fight for health and happiness,
And on each trusty blade,
You'll write the glorious motto, HEALTH.
Hurrah, for your Crusade. (*All together.*)

STRANGER (*The Stranger sings the Crusade song "Happy Young Crusader" to Mendelssohn's "Spring Song."—Words in Crusade Manual.*)

(*All the fairies escort her to the edge of the earth dancing a folk dance—Vengerka.*)

As a second example of a successful dramatization of a textbook story, we may cite "The Land of Health," a play prepared for the children of the third and fourth grades in the public schools of Dayton, Ohio. This has frequently been produced in a very simple manner with the front of the classroom for the stage, scenery and costumes being left to the imagination. On at least two occasions this play was presented in a more elaborate style, having been worked out as a project in which health director, gymnasium instructor, and dramatic teacher, all coöperated. Teachers wishing to use "The Land of Health" may obtain printed copies of the play by writing direct to the publishers, Charles E. Merrill Company, New York.

### Topics for Investigation and Discussion

1. The use of poems, stories, and dramatizations as a means of developing a health consciousness.
2. Different types of dramatizations that may be used effectively in teaching health habits.
3. Sources from which poems, stories, and dramatizations may be secured.
4. Criticism of poem, stories, and plays published in this chapter.

# CHAPTER XXIV

## GAMES AND OTHER PHYSICAL ACTIVITIES

**Qualities Needed in Physical Activities.**—The place of games and physical activities in the daily program of both teacher and pupil has been stressed in the preceding chapters. To achieve the best results the games and physical activities woven into the health-teaching program must have certain very definite qualities. First of all, the games employed should be of a type to permit as many of the children as possible to participate. They should also provide opportunity for social development and leadership by giving the children a large share in the selection of their leaders. Moreover coöperation and team work are as important as rivalry. Finally, the game should be of such a nature that the children may carry it with them into the out-of-school life. The games should, of course, appeal to the interests of the different school groups, and they should be selected for their power in developing physical ability and healthy growth. They should be organized according to bodily changes that take place in growing children and the corresponding changes in their interests and activities. Though we recognize their value, no attempt has been made in this chapter to outline a system of formal gymnastics. Local and state directors of physical education provide programs for schools throughout the

country. They give the fundamental principles of progression and illustrative progressive exercises, with specific drills suitable to local conditions and adaptations to the needs of particular groups. We have attempted here merely to give a few selected, typical games that have proved their value in actual use with many types of children in widely separated localities.

**Physical Activities and the Curriculum.**—It must be remembered that the games and other physical activities are not separate and distinct in themselves. They are not for recreation alone though they have a very important recreational value; they are not for enjoyment alone, though they should give the children pleasure; they are to develop the child physically, mentally, and socially. The teacher, therefore, should so link her physical activities with the other subjects of her curriculum that she will obtain improvement in both mind and body.

The planning of the games and activities can be used in the classroom to develop the children's language ability. In the upper grades of this group the pupils can explain how to play a new game, one of the best forms of exposition. The qualities of good citizenship—fair play, keeping the rules of the game, coöperation for the success of the group, class pride—can correlate the physical activities with the work of the civics class to the strengthening of both. The necessity of coöperation and competition, of law and the obedience to law, methods of determining and applying the rules of the game, can be connected with class government and the study of state and local government. In the hygiene class, the relations of

physical activities to sleep, food, and clothing should be stressed.

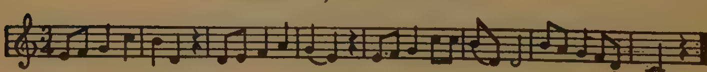
**How to Use the Games and Activities.**—In selecting games and activities for her class, the teacher should consider not only the demands, both physical and mental, that they will make upon her group, but also their relation to some health topic she is just then emphasizing in the classroom.

When possible, the teacher should herself take part in the games and activities. Not only can she thus better guide her pupils but she will herself share in the recreation and benefit that comes from the play period. Always the teacher must see that fair play and the rules of the game are observed. She will see that the timid ones are not overlooked or bullied. In selecting from the suggestive games given herein the teacher should feel free to vary them as the special needs of her group, or the special conditions under which she works, may determine. She should remember that this list is suggestive only; it does not contain even the extreme minimum of what should be taught. She must supplement the hints given here by resort to her own imagination and invention and use the originality of her pupils in devising activities for special purposes.

## Group I. Grades 1, 2, 3.

### Singing Games

HOW-DYE-DO, MY PARTNER [1]



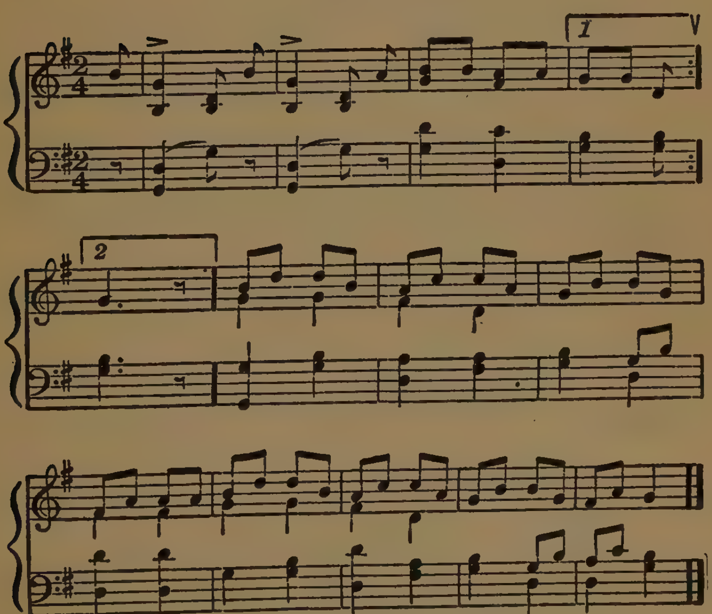
[1] Mari Ruef Hofer. *Popular Folk Games and Dances.* A. Flanagan Co.

(Circle formation.) 1. One player in center walks up to one of the circle players and bows. 2. That player returns the bow. 3. They join right hands and left hands.

Chorus: Skip around in center of circle singing tra, la, etc. Game starts over again with those two in the center. The next time there are four in the circle and so on.

1. How-dye-do, my partner.
2. How-dye-do today.
3. Will you dance in the circle?
   I will show you the way.
      Chorus: Tra, la, la, la, la, la.

I SEE YOU.[1]




[1] Mari Ruef Hofer. *Popular Folk Games and Dances.* A. Flanagan Co.

Arrange class in groups of fours. In each group, the partners stand one behind the other, facing another couple a short distance away.

Number one of each couple is in front with hands on hips, number two behind with hands on shoulders of number one.

"I see you."

Number two bends to right looking at other number two over partner's shoulder. (One measure.)

"I see you."

Number two bends to left. (One measure.)

"Tra la la," etc.

Number two bends quickly right, left, right, and holds position. (Two measures.)

Repeat words. Number two begins, bending to left. (Four measures.)

"I see you, then you see me,
If I take you, then you take me."

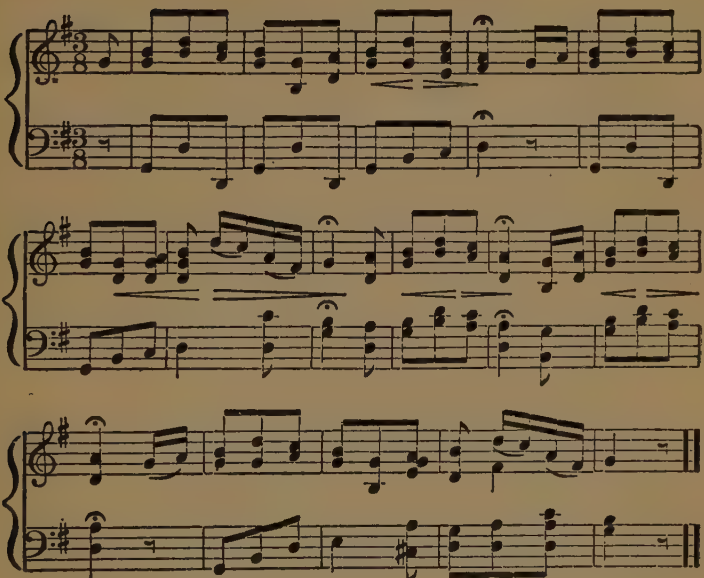
All clap hands, numbers two going to right of partner, skip forward, join both hands, and turn each other around. (Four measures.)

"If you see me, then I see you.
If you take me, then I take you."

All clap hands.

Numbers two join hands with own partners, turn them around and on last note, finish in first formation with number two in front this time. (Four measures.)

MAY DANCE [1]



Double circle formation, all facing line of direction, right hands joined, *girls* on outside.

"The cuckoo is singing, the springtime is here."

Beginning outside foot run forward nine steps and courtesy.

"In the field and the forest the green doth appear."

Repeat in opposite direction.

"Then dance, children, dance."

[1] ELIZABETH BURCHENAL and C. WARD CRAMPTON. *Folk Dance Music*, a collection of seventy-six characteristic dances of the people. G. Shirmer, Inc.

With three running steps, change place with partner and courtesy.

"While the sky it is blue."

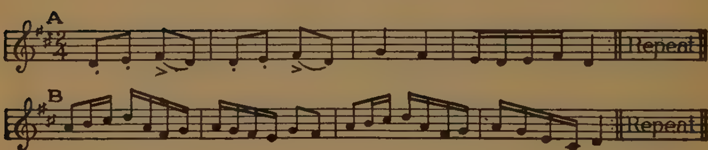
Repeat back to place.

"Turn round and turn under while I dance with you."

*Girl*, with six steps turns once around in place going under her own right arm and then runs forward with three steps and bows to new partner.

### Group II. Grades 4, 5, 6.—

DANISH DANCE OF GREETING [1]




Single Circle. Partners side by side.

(A) Sing: "Step and bow." Step to one side and bow to partner.
"Step and bow." Turn around and bow to player on other side.
"Stamp, stamp." Stamp right foot. Stamp left foot. Hands on hips.
"Turn around." Turn around in place.

(B) All joins hands and facing toward the right run lightly for sixteen steps, singing "Tra, la, la, la." Without pausing, turn and run sixteen steps to the left.

"(A)" represents happy greeting. "(B)" represents the pleasure of being together.

[1] C. Ward Crampton. *The Folk Dance Book.* A. S. Barnes & Co.

### THREE DEEP [1]

Group the players in couples and form them in a circle all facing in. Select a player as runner and another as chaser. The chaser tries to tag the runner who tries to escape by dodging in and out the circle. If the runner is not caught and is in danger, he may seek refuge by standing in front of some couple, thus making "Three Deep." The outermost player in the "Three Deep" line must now become runner and try to escape being tagged. If the chaser catches the runner, the runner becomes the chaser and the former chaser, the runner.

This is an excellent game to develop alertness and quickness, for the rapid changes are very uncertain.

### RELAY RACES [1]

Divide the players into two even lines. The players stand about a foot or two apart, one directly behind the other. At the command "Go" the first player in each line passes backward over his head a medicine ball, basket ball, or football. Each player in turn must catch the ball and toss it to the next. The last player in the line, as soon as he catches the ball, runs with it to the front of the line and passes it back; and so on until each player has run. The line whose first player gets to the front again first, wins the race. If a player should fail to catch the ball or should let it drop, he must go after it, come back to his own place, and then toss it.

This may be varied by having the players hop on one foot or walk on heels up to the line, or run forward and pitch the ball through a goal, return to front of line, and toss.

Bean bags may also be used. When used, the race may be made more exciting by having the players catch the bag in left hand, transfer it to right, and toss. The same race may be changed for boys by passing the ball between the feet instead of overhead.

[1] *Play and Athletics for the Public Schools.* State Board of Education. Richmond, Va. 1920.

**Group III. Grades 7, 8, and Junior and Senior High Schools.—**

In these grades emphasis will naturally be laid on more or less organized competitive athletics, and the actual work of the teacher will depend very largely on local conditions. It should be her aim, however, to secure so far as possible adequate facilities for athletic exercises and to use them for the continued development of health teaching and ideals of sportsmanship. Every high school should have a properly equipped athletic field. The minimum requirements for such an equipment are here reproduced.[1]

### Equipment for General Athletics and Layout of an Athletic Field

*Horizontal Bar.*—A horizontal bar for chinning and other stunts should be located so that it will not interfere with the free play space. Sink uprights 4×4 inches about 3 feet deep and set in cement. For a bar use 2-inch plumbing pipe. Place the bar about 7 feet high, so that when the pupils are hanging by the hands, their feet clear the ground. Three uprights will take care of two horizontal bars, one high and one low. The low horizontal should be about $4\frac{1}{2}$ feet from the ground.

*Jumping Pit.*—The construction of a jumping pit for high and broad jumping is essential. The pit should have a minimum dimension of 8×20 feet. Excavate this area to a depth of 2 feet and fill in with shavings and sawdust. A mixture of sawdust and sand might provide a soft enough landing for boys, but for girls a mixture of sawdust and shavings (no sand) is advisable.

A scratch line or take-off at one end of the pit for broad jumping is provided by imbedding a joist 8 inches wide and 2 feet long firmly

[1] "State Course of Study, High Schools of Virginia." *Physical Education*, 1924, Volume VII, No. 1, Supplement 3, Bulletin State Board of Education, Virginia.

in and on the same level as the ground; two stakes of 1×6-inch boards driven into the ground at the ends of, and nailed to, the imbedded joist, provide an admirable anchor for the scratch line. If a pit 8×20 feet is used, the joist should be set about 6 feet from one end of the pit to assure a landing for a jump of 18–20 feet.

*Straightaway Dirt Track, 50–75 Yards.*—With a little work, each rural high school can provide a suitable straightaway track of 50–75 yards. The track should be 10 to 12 feet wide, and carefully graded after locating it on the most nearly level part of the school ground. This track will take care of all running events of interscholastic athletics. Dirt or clay tracks are quite fast in dry weather. Every high school is urged to provide a running track either of dirt, as suggested above, or of cinder.

*Straightaway Cinder Track.*—The cinder track can be made very easily and practice can be held thereon immediately after a rain. In its construction use the soft coal ashes taken from the heating plant of the school. Screen these ashes, reserving the fine screening for the top layer and the lumps and clinkers for the foundation. Do not mix clay or sand with soft coal ashes, as the dirt will gradually work up through the ashes after the track is made and this will give sufficient binding. A straightaway can be excavated to a depth of about 4 inches and then the larger lumps deposited on the dirt for a foundation for the finer screenings. The fine ashes are then spread evenly over the lumps and rolled. It will be possible to make a straightaway without any excavating by placing a layer of fine ashes to a depth of about 2 inches on top of the clay. After the top surface has been rolled, it should be dragged with a heavy plank having a piece of carpet or canvas nailed to the underside.

*Dimensions of an Oval Track for Large High Schools.*—There are some rural schools, particularly the consolidated high schools, which will desire oval tracks of one-fourth or one-fifth mile. In tracks of these lengths the attempt is always made to secure the maximum length for a straightaway with adequate provision for reasonable curves.

In order to conform to the Olympic rules, the National Collegiate Track Rules Committee adopted the ruling that the length of tracks

shall be determined by measuring 12 inches from the pole. The track 12 inches from the pole should measure exactly 440 yards for the quarter-mile oval, or 352 yards, for the one-fifth mile. All tracks should be about 12 feet wide.

For directions for laying the cinders on an oval track see the description above for a straightaway.

Drawing the pole on a true oval-shaped track enables an inferior runner to keep the pole throughout the race. On the other hand, a track with too abrupt curves is a handicap to runners. After investigating dimensions of various collegiate tracks, the Physical Education Department of the State Board of Education recommends the dimensions given above for the one-fourth mile and for the one-fifth mile tracks.

*Badge Tests—Physical Achievement Tests.*—Through its Extension Bureau, the University of Virginia conducts badge tests for boys and girls in the schools throughout the state. Badges are given gratis to the boy or girl who can pass the required standards, and the practice has proved very helpful in developing athletic interests.

The selection of the actual events for a physical achievement test is a matter of opinion that each teacher may determine. The events of the test, however, should comprise running, jumping, throwing, climbing or hanging, and should measure strength, speed, accuracy or skill, and endurance. The events for a physical achievement test then may obviously be selected from those events suggested for the general athletic period, and might include:

For Boys:

1. Running 50–75-yard Dash
2. Running Broad Jump
3. Chinning
4. Push-up
5. Baseball Throw for Accuracy and Distance
6. Sit-up

For Girls:

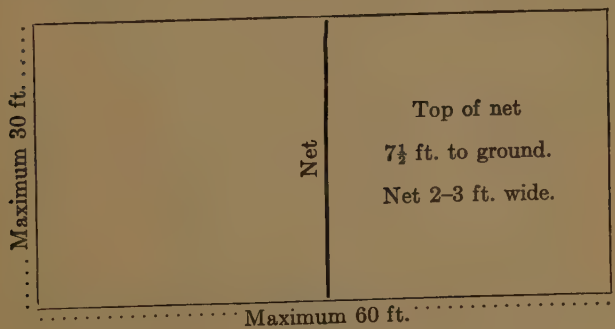
1. Running 50-yard Dash
2. Basketball Throw for Distance—both hands pushing ball from chest.
3. Sit-up.
4. Deep Knee Bend
5. Baseball Throw for Distance
6. Volley Ball or Tennis Serve

From the above a pentathlon of five events may be devised for each high school. The particular value of a physical achievement test lies in its ability to interest the boy and girl in their own personal growth and development as indicated by their record of physical efficiency and to inculcate a desire to better this record—a physical achievement—by means of individual practice of these healthful events during leisure and recreational periods and by means of hygienic training rules or health habits of eating, sleeping, etc.

The individual's physical efficiency in the events of the physical achievement test is measured at the beginning of the school session. The measurements of their physical efficiency may be recorded by the pupils and at stated intervals of three weeks, for instance, another test is given. The gain in the physical efficiency of the individual represents his or her Physical Achievement.

The first trials in the events of a badge test can represent physical efficiency and the subsequent gain in these events may be classed as physical achievement.

*Volley Ball.*—Because this game is practically unlimited as to players, because it is one of the few games which are conducive to the correction of posture, and because it is a safe game even for the physically under-privileged pupil, it is recommended as one of the standard games for high school girls and boys. Official dimensions of a volley ball court follow, but smaller courts are permissible and necessary at times.



Ball: Regulation volley ball.

Players: Any number of people may play, provided there are an equal number of players on each side of the net. Official teams are composed of twelve players each.

The players are usually formed in rows. If there are twelve players, there should be three rows of four players each. After each serve each player moves to the position of the next person on his left. The first server is the player who is in the last row in the right-hand corner (facing the net). The next player to serve is in the front row in the left-hand corner. When it is his turn to serve, he goes back to the server's position in the last row, all the other players moving one place to the left. The player on the left end of each line takes the place of the player on the right end of the line in front.

The object of the game is to bat the ball with the open palm or palms, as both hands may be used, and keep the ball volleying back and forth over the net, from one side to the other, without touching the floor or ground on either side.

Rules.—1. The captain of each class team tosses for court and service. The winner of the toss chooses either first service or court.

2. The game is started by the first server standing with both feet on or back of the back line of the court, and from there serving the ball by tossing it lightly in the air with one hand and batting it with the palm of the other.

3. The server may have two trials to get the ball over the net. When a served ball touches the top of the net in going over, it shall be called a net ball, and the server shall be entitled to another serve.

4. The ball when served may be struck once by one other player on the server's team to assist it over the net.

5. If the ball in the first serve goes out of bounds (outside the court), or hits the net or posts, or is struck twice in succession by the same player, it is called a *dead ball* and must be served over. If the second ball of the service becomes a *dead ball* the ball goes to the other side.

Teachers who wish to stimulate interest in athletics should keep closely in touch with the rules governing

athletics in their own states and with the work of the American Physical Education Association, Springfield, Massachusetts. Before planning any form of competitive athletics for girls, the leaders should be thoroughly familiar with the progress made by the Women's Division of the National Amateur Athletic Federation, which is serving as a clearing house for regulations regarding athletics for girls and women. Information in regard to its program may be obtained by writing to its Executive Secretary, Room 1712, 110 East Forty-second Street, New York City.

### Topics for Investigation and Discussion

1. Qualities of games and other physical activities that are necessary in achieving the best results.
2. Basis for selection of physical activities for particular group.
3. How physical activities may be connected with the other subjects of the curriculum.
4. Advantages or disadvantages of competitive athletics.

# CHAPTER XXV

## THE COMMUNITY AND HEALTH

Throughout this book we have considered the school's responsibility in safeguarding the health of the pupils and the relation of physical development to education, but education does not begin with the school nor end with it. In a very real sense everything that enters a man's life from his birth to his death contributes to his education. The work of the school must be supported by an intelligent appreciation and coöperation on the part of the community itself. If harmful habits are established before the child enters school and if health habits are allowed to lapse when the child leaves school because of unfavorable social environment, there is a great waste of time, energy, and health at the expense of both the child and the community. To make health habits lasting the community must not relax its efforts either before the child enters school or after he leaves it. The teacher has not fulfilled her full responsibility to society unless she does her best to see that the home and the community are coöperating with the school in its great task of building healthy future generations.

"Of all living things the child is the most sensitive to environment." From its surroundings it acquires the feel and tone that govern its life. If health is not a

matter of social concern, the child will suffer, in spite of all that the teacher does for him in the classroom. The relation of heredity and environment is still a matter of dispute, though much valuable work has been accomplished by biologists, psychologists, and sociologists in this field. While we have done little as yet to control the innate tendencies with which a child is born, we can provide an environment that will promote development of desirable tendencies or the suppression and redirection of the undesirable. It is the duty of society to provide each individual with opportunity for self-development that the child may make its greatest possible contribution to the welfare of others.

**Units of Environment.**—Any influence upon the individual is a part of his environment. We cannot say that the environment is the home, church, school, the social milieu, or the state, but a constant adjustment of all these individual influences. Each of these factors contributes to the enrichment of life, and for the building of a well-rounded socially valuable individual the home, the church, the school, society, and the state must each do its part.

**The Place of the Home in Health.**—Of all the environmental influences for the building of personalities and health, the home is the most important. The family is the greatest organization for the conservation and preservation of life, and the building of a home is worthy of the finest contributions of science, philosophy, and religion. The real homemakers, who have succeeded in banishing the commonplace in life through love and knowledge, are the greatest forces in the world today and must be given due consideration in

any well-balanced program of living. If the health of the nation and of the child is to be safeguarded, health must be taught and practiced in the home. More and more we are realizing this, and society is applying itself to the task of teaching its homemakers lessons of health.

Many community groups are being formed to bring about a closer coöperation between homes and educational forces. Although much has been done, the community has not yet awakened to the full consciousness of its duty in safeguarding the home for health.

**Other Community Health Forces.**—In every civilized state today the government itself has taken measures to teach health and preserve it. In its special field a tremendous amount of good has been accomplished, but it has often resulted that this work was done in isolated fields and was not sufficiently linked up with other social forces. Throughout the world today there is a strongly aroused health consciousness. As a result, health organizations for work in the home, school, and state have been formed everywhere and have done much excellent work in their particular fields.

A May Day celebration may be used to promote health and community spirit as one small town found on experiment. This town united its own schools and the rural schools within a radius of thirty miles in a great May Day festival in which one thousand four hundred children participated, while there were more than eighty volunteers on the various committees. The results of this celebration were far-reaching.

1. The schools were given new games, and were quickened with a spirit of new life.

2. Through the community center the rural school children and the grown-ups who came with them were given a point of contact with the town. Neighborliness was established between the different sections of town and country.
3. A valuable demonstration was given of the effectiveness of athletics, drills, folk dances, new games, community singing, and outdoor motion pictures, in promoting a spirit of health and happiness.[1]

The unification of all social forces for health is the great task of the future, for more and more it is becoming apparent that health and health teaching cannot be confined to one section of our citizenship or to one environmental factor. All must be used for the production of a healthy environment that will surround each individual from his cradle to his grave. The community must so organize all of its activities that it will not only reach every child in the community, but every adult as well. One community has made a beginning in this direction by calling a meeting of its division superintendent, county nurse, county sanitary officer, county home demonstration agent, county president of school leagues, and president of county teachers to work out a coöperative program.

> *Aim.* To provide the physical environment and to put into practice the hygienic principles essential to the sound physical, mental, and moral development of the child.

The agencies coöperating were:

1. County School Board.
   a. Adequate seating facilities, heating, lighting, and ventilating.

[1] *May-Day Festivals* by American Child Health Association and the Poet's Guild.

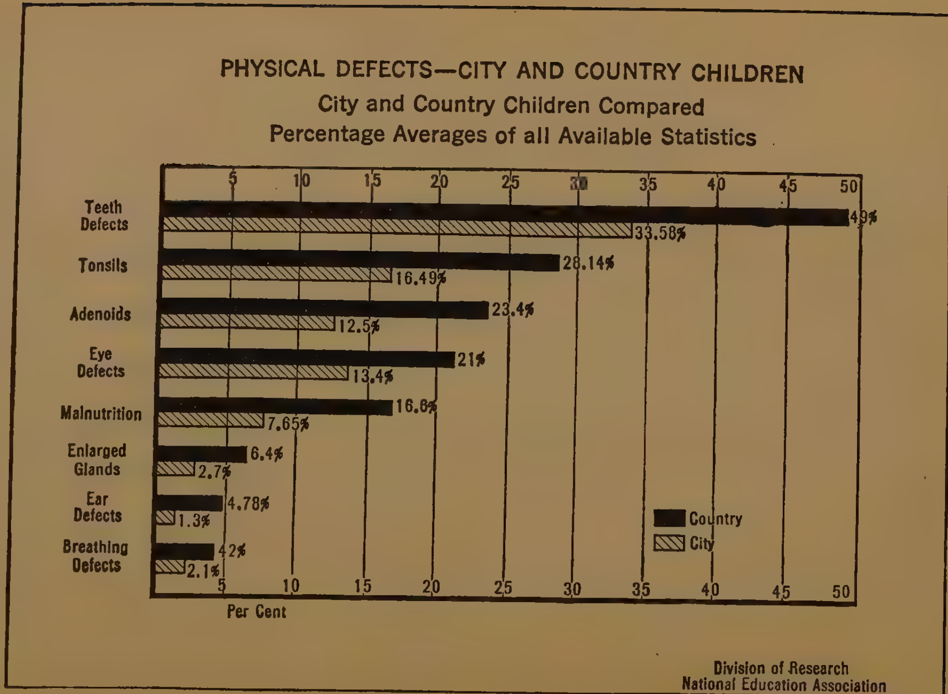



FIG. 15.—Graph showing startling need of greater attention to health problems among

*b.* Providing floor oil for the oiling of the classrooms semi-annually—September and January.
*c.* Providing water coolers.

2. Teachers.
*a.* Physical inspection of each pupil enrolled, notice of defects sent to parents and report of same sent to Division Superintendent and Health Department.
*b.* Requiring individual drinking cups.
*c.* Physical education (Daily exercises and teaching of health—checking up of health habits).
*d.* Supervised lunch in school.

3. County School Leagues.
*a.* Senior League to clean semi-annually school building and school grounds, to wash windows, and to oil floors.
*b.* Junior League to provide scales for weighing and measuring, elect a School Board of Health, keep school building and grounds clean.

4. County Home Demonstration Agent.
*a.* Stimulating interest in food values and assisting in providing hot soup or other lunch in the school.
*b.* Demonstration of home-packed lunch.
*c.* Milk campaign to increase consumption of milk in county.

5. County Health Department.
*a.* Sanitation of grounds.
*b.* Providing safe water supply.
*c.* Control of communicable diseases.
*d.* Checking up of inspection.
*e.* Sanitation of water cooler and cups.
*f.* Correction of physical defects.
*g.* Supplying health material.
*h.* Assisting teachers and pupils in carrying out their programs.

**Coördinated Group Activities.**—In an effort to obtain a unified health program, the American Child Hygiene Association, which had specialized on the prenatal, infant, and pre-school child's health, and the Child Health Organization of America, which had stressed the health of the school period, combined to form the American Child Health Association that would consider all aspects of child health. The new body was to work in certain selected communities, to bring to bear upon all phases of child health the best skill and experience of authorities in this line, and to demonstrate what could be accomplished by the application of coöperative effort to health problems. In planning the program for such community health work the field director stressed the point that it must be thoroughly practical and of direct benefit to every child who came in contact with it. The work was to be conducted at the most reasonable cost consistent with thoroughness in order that similar programs might be carried out by public authorities elsewhere. To coöperate with the community there was sent into each city selected for experiment a field force to organize and direct a complete child health unit. This field unit was to establish a child health center and to work out a complete program for health protection and the education and development of the school child. The community shared in the work by appointing a local advisory committee to assist the field force in any way possible and to endeavor to secure the cordial coöperation of all community agencies. The general working program was as follows:

1. *Pre-natal Care.* To include:
   - *a.* Necessary complete physical examinations and treatment, including dental treatment, of expectant mothers.
   - *b.* Instruction and supervision of expectant mothers at the center and through home nursing service.
   - *c.* Securing of proper maternity care, with visiting nurse service after birth.

2. *Infant Health Service.* (To two years of age). To include:
   - *a.* Regular weighing and medical examination.
   - *b.* Instruction of mothers in care, hygiene, feeding, etc.
   - *c.* Visiting nurse service in all necessary cases.

3. *Pre-School Health Service.* (Two to six years.) To include:
   - *a.* Continuing supervision of children, medical examination and treatment, including nutritional, dental, nose, and throat treatment, as necessary.
   - *b.* Home nursing service when necessary, etc.

4. *School Health Service.* To include:
   - *a.* Regular thorough examination of each child.
   - *b.* Regular weighing and measuring of each child.
   - *c.* Medical service and service of the school nurse, including visiting nursing for those requiring it.
   - *d.* The organization, in special nutritional groups, or classes, meeting regularly, of all children who are obviously below par as determined by examination. These groups to be handled along standardized lines, including special instruction in health and hygiene, necessary attention to diet, medical treatment, removal of physical defects, etc., coöperation with parents through home visiting and through securing attendance of mothers at meetings.
   - *e.* The organization and improvement of health instruction through the medium of courses in health education for the teachers, etc.[1]

[1] The Commonwealth Fund Program for Child Health, June, 1922.

**Community Coöperation.**—To obtain adequate community organization each town was required to coöperate not only by the appointment of a local advisory committee and the use of its existing health organizations but also to undertake binding financial agreements. For the first three years of this community experiment the cost of the work was to be borne by an appropriation from the Commonwealth Fund. At the end of the third year the community was required to undertake some portion of the expense of the local center. After the first three-year period the Commonwealth Fund for an additional two years agreed to meet any part of the expense not covered by the local community itself, provided a substantial portion of such two-year budget had already been assumed, and provided also that the community gave reasonable assurance that the work would be continued at the sole expense of the locality after the expiration of the five-year period. Under the terms of this agreement the Commonwealth Fund put field forces in Mansfield and Richland County, Ohio, in January, 1922; in Fargo, North Dakota, in January, 1923; in Athens, Georgia, in January, 1924; in Murfreesboro and Rutherford County, Tennessee, in January, 1924; in Marion County, Oregon, in January, 1925.

The demonstration in Mansfield and Richland County, Ohio, is on a different basis from the others, since it is financed by the American Red Cross, and not by the Commonwealth Fund. The Commonwealth Fund demonstrations are not administered directly by the American Child Health Association but under a committee representing the Common-

wealth Fund and The American Child Health Association. The Red Cross demonstration also has an advisory committee, but the administrative responsibility is not assumed by this committee to the same extent.

**Results.**—Because of the recency of these experiments no final report of their activities has yet been published, but reports of interesting and valuable results obtained from the Mansfield and Fargo demonstrations (the older ones) will soon be available. Much excellent work, however, has been done in organizing communities for health in each of the sections named. Partial reports now available give a picture of the great benefits to be derived from a closer coördination of all community activities in the interest of health. In Fargo the improvement record of gains made by school children is particularly noteworthy. In the report of Mansfield County, Ohio:

> The most notable fact has been the combination of the city and county health personnel into a full-time joint health department, and the appointment of the director of the demonstration as Health Officer, thus centering responsibility for the maintenance of much that the demonstration has started. The new joint health department is actively broadening its program of sanitary inspection and disease control. . . . Under the Council of Social Agencies there has been developed a Case Work Committee with the coöperation of the director of the demonstration, which has done much to bring together the work of the different agencies and to establish better standards. The Council is also attempting to bring about an even closer correlation of such work in the districts of the demonstration area. The medical and nursing work carried on under the auspices of the demonstration has been increasingly accepted by the community as a part of the community program.

The education and nutrition programs have been effective in reducing the number of under-weight children and in infusing the entire school curriculum with the modern health idea. One of the most significant developments during the year was a symposium emphasizing the preventive phases of pediatrics for the local practicing physicians, arranged at their request by the Director of the Demonstration, and the Medical Division of the American Child Health Association. This included lectures, clinical demonstrations, and discussions by outside specialists brought in for the purpose, and was pronounced a great success by the physicians. The nursing work has been used by the Western Reserve School of Nursing for field observation for three groups of student nurses, and a normal training course in Mansfield is being recognized by representatives of the State Department of Education as a valuable contribution to standards for such work throughout the state.[1]

**Milbank Memorial Fund Demonstrations.**—We have cited the conditions of these Child Health Demonstrations in detail because they typify so well the principles of community health organizations. The Milbank Demonstrations in Cattaraugus County, in Syracuse, and in New York City are more recently initiated examples of the same type of leadership. In Syracuse the inauguration of the Milbank Health Demonstration has done wonders in awakening public opinion in the city to the importance of the health of the school child.

As the school health work progresses, increased in scope and effectiveness by the addition to the school staff of a full-time school physician, six additional school nurses, three dental hygienists, and a director of health education, increasing evidence is available to show that the enlarged program is resulting in marked improvement of the general health of Syracuse children

[1] *Child Health*, November, 1924.

of school age. Medical and physical examinations are made of each pupil at the beginning of each school term. In addition, the medical inspectors and nurses make a weekly inspection in each classroom in order to prevent the spread of disease. The medical inspection given every child on the opening of school in September, 1924, showed the children to be in better physical condition than at any previous school opening since such examinations were started.

Although recent records do not show a marked growth in the numbers of such examinations, which the increase in the number of examined might lead one to expect, there has been a decided improvement in the character of these inspections. They are now being conducted more deliberately, and with greater attention to detail. A report to the parent or guardian is made covering the health and physical development of each child. When defects are found, remedial suggestions are given. If the child is discovered to be suffering from adenoids, diseased tonsils, defective teeth, faulty vision or hearing, parents are given advice as to how to proceed in having the condition remedied. The nurses follow up these suggestions in the home and often assist parents in carrying them out.

That this effort is resulting in the correction of the defects found is indicated by the records. In the year 1922–1923 a total of 5325 children had defects corrected which had been discovered at school. In 1923–1924 a total of 7195 children had defects corrected. In other words, in the earlier period, 55 per cent of the children whose parents' attention was called to their defects had them corrected; while in the latter 91 per cent of

the children were interested in having their defects removed.

It has long been known that diseased teeth are responsible for a great amount of ill health among school children, including anemia, nervous troubles, rheumatism, heart disease, chorea, and numerous other acute infectious diseases. It has been estimated that about four-fifths of all school children need dental attention. Funds from the Health Demonstration have made it possible to carry out an oral hygiene program in the Syracuse schools. As a result, during the year 1923–1924, the dental hygienists have examined the teeth of 8356 school children, charted the teeth of 3267, and cleaned the teeth of 1962. During this period 2597 children have been recommended to family dentists. In 797 classes children have been given lessons on the care of the teeth and taught to regard the toothbrush as a friend.

As a child grows, every advance in inches calls for a related advance in pounds. With this idea in mind all the children are weighed and measured in the Syracuse schools. In 1922–1923 there were 18,097 children weighed in the schools, and in 1923–1924 there were 22,359. In the first period of examination, 16 per cent of the children were found under-weight; and in the last, 14 per cent. It is expected that as the school health work progresses this percentage will be further reduced.

There is no part of the program more important than that of health education. Funds made available through the Syracuse Health Demonstration have made possible the employment of a Director of Health

Education who exercises general supervision over health work in the various schools, going from room to room instructing the pupils in health lessons. The Director has made use of numerous ingenious and attractive methods to gain and hold the interest of the children. Among some of the interesting features she has established are health clubs, where groups of under-nourished children are brought once a week for a period of forty-five minutes. During this period the children are weighed and measured and given special instruction in health habits. Parents are invited to attend these sessions, and their coöperation is sought in enlisting the child's interest in his personal health. There has been a marked improvement in the general health of the children in these classes. School health clubs have also proven a valuable part of the health education program.

The treatment and examination for goiter, which during 1923–1924 was made the subject of a special survey by ten school physicians assisted by nurses, was continued during 1924–1925. All of the children registered in the public schools in 1923–1924 were examined, there being a total of 25,875. About 16 per cent of the total school population was found to have demonstrable goiter, the condition being about three and one-half times as prevalent in girls as in boys. The nurses and doctors reported that in 423 of the cases treated the goiters had disappeared, and in a still larger group there had been improvement.

Such demonstrations as those which have been discussed affect primarily the particular communities in which they are carried on, but they have been

described here as suggestions to the teacher of the type of community health organization which she should dream of as an ideal background for her work and which she should strive to bring toward realization whenever she has an opportunity to influence the course of social development in her community.

**Facing the Future.**—In our fuller appreciation of the real worth of human life we are developing more clearly defined scales of values for the forces that work in our lives. In any such scale of values coöperative health activities must occupy a high place. If disease and ill health are ever to be banished from this planet, they will be banished only as a result of organized social effort in which each individual will realize his responsibility and live up to it fully and freely. Public health is coöperative health.

Intellectually we may know many things, but such facts can never be of their greatest value unless there is an inward awakening to their importance and a clear, reasoned application of them in every-day life.

As teachers, we are educating the citizens of tomorrow, upon whom depends the progress of the future. We are living for a longer time than today. We are teaching others, and through them yet others how to apply the loftiest principles of living in their own lives and how to organize the world in such a way that every individual will have the opportunity to enjoy a fuller life of freedom and happiness. It is our privilege to help free the world from the suffering caused by ignorance, indifference, and selfish ambition, and our greatest satisfaction comes not through the

# APPENDIX II

## SELECTED BIBLIOGRAPHY

The bibliography of hygiene and sanitation, and of the pedagogy of hygiene and sanitation, is so extensive that the authors have felt it unwise to attempt anything remotely approaching an exhaustive list of references. It has seemed that a brief selected bibliography of a few of the most important works, such as should be found in any good public library, would on the whole prove more useful to the teacher; and the following list has been prepared with this end in view.

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American Posture League. 1 Madison Ave., New York City.

American Medical Association. 535 N. Dearborn St., Chicago, Ill.

American Red Cross, Washington, D. C.

American Social Hygiene Association. 370 Seventh Ave., New York City.

Association for the Prevention and Relief of Heart Diseases. 370 Seventh Ave., New York City.

Boy Scouts of America. 200 Fifth Ave., New York City.

Bureau of Education. Department of the Interior, Washington, D. C.

Camp Fire Girls. 31 E. 17th St., New York City.

Child Welfare League of America. 130 E. 22d St., New York City.

Children's Bureau, U. S. Department of Labor, Washington, D. C.

Committee on Foods and Nutrition, National Research Council. 1701 Massachusetts Ave., Washington, D. C.

Elizabeth McCormick Memorial Fund. 848 No. Dearborn St., Chicago, Ill.

Girl Scouts, Inc. 670 Lexington Ave., New York City.

Joint Committee on Health Problems in Education. Dr. Thomas D. Wood, 525 W. 120th St., New York City.

Life Extension Institute. 25 West 45th St., New York City.

Metropolitan Life Insurance Co. New York City.

National Amateur Athletic Federation of America. 1 E. 104th St., New York City.

National Child Welfare Association. 70 Fifth Ave, New York City.

National Committee for Mental Hygiene. 370 Seventh Ave., New York City.

National Committee for the Prevention of Blindness. 130 E. 22d St., New York City.

National Congress of Mothers and Parent-Teachers' Associations. 1201 16th St. N.W., Washington, D.C.

National Dairy Council. 910 S. Michigan Ave., Chicago, Ill.

National Health Council. 370 Seventh Ave., New York City.

National Organization for Public Health Nursing. 370 Seventh Ave., New York City.

National Safety Council. 168 N. Michigan Ave., Chicago, Ill.

National Tuberculosis Association. 370 Seventh Ave., New York City.

National Women's Christian Temperance Union. Evanston, Ill.

Philadelphia Interstate Dairy Council. 1211–1213 Arch St., Philadelphia, Penna.

Playground and Recreation Association of America. 315 Fourth Ave., New York City.

The Rockefeller Foundation. 61 Broadway, New York City.

The Russell Sage Foundation, New York City.

The Society for the Study and Control of Cancer. 370 Seventh Ave., New York City.

United States Bureau of Education. Washington, D. C.

United States Department of Agriculture. Washington, D. C.

United States Public Health Service. Washington, D. C.

Women's Foundation for Health. 370 Seventh Ave., New York City.

Women's Press. 600 Lexington Ave., New York City.

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1374 – [illegible]
1776 – [illegible]
1798 – U.S. –
1842 – Eng. – [illegible]
18[illegible] – [illegible]
1881
history of

Hands. 2 Defects of the eye.
Hips. 3 Astigmatism
Head. 4 Myopia - near sighted
Hyper-metropia far sighted

Grind.
Grate.
Grasp.

Crawl.
Curl. Impedigo - Contagiosia
Crouch. Treatment - Wash with soap + water.

Wave. Remove scab + apply
Weave. Ammoniated -
Wing. Mercury.

Scabies or Itch - Sulphur ointment applied three nights in succession. Using the same bedding and night clothes. At end of this time clean clothes and hot bath.

Bloo

1. Left ve
2. Aorta
3. Ar
4. Ca ... ies.
5. Si ...
6. La
7. Ri
8. Ri
9. Pu
10. L
11. P
12. L
13. L



1. N ... h about
2. P ... minute
3. D ... by nerve ... the lower
4. Trachea ... Part of the brain.
5. Bronchi
6. Lungs. (air sacks or Alveoli)

Respiration

These are controlled by the